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Improving Provider Productivity: Impact of Coder-Coaches on Provider Documentation and Coding

A Graduate Management Project Proposal submitted to Dr. Hope Ruiz, Faculty Advisor,

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Abstract

The military health system (MHS) is beginning a dramatic shift towards controlling costs and increasing productivity. In order to achieve these goals, the MHS initiated the Jumpstart Program, which provided Tripler Army Medical Center (TAMC) $924,000 to hire 12 coder-coaches and 3 consultants to increase provider workload by 69,900 relative value units (RVUs). The coder-coaches directly assist and coach providers in improving the documentation and coding of encounters. The purpose of this study is to investigate the impact of coder-coaches on provider productivity, measured in RVUs, through improved documentation and coding at three clinics at TAMC during the first quarter (Q1) FY06. The results of the study support the function of coder-coaches in increasing RVUs through better coding and documentation. The full-model regression equation accounted for (R^2) 66.73% of the variance in productivity ($F^{4, 40} = 20.06$, $p<.000$). Analysis of variance (ANOVA) test showed that the Family Practice ($F^{2, 8} = 18.06$, $p<.01$), Orthopedic ($F^{2, 8} = 17.23$, $p<.01$), and Obstetrics clinics ($F^{2, 8} = 8.81$, $p<.01$) had higher productivity during Q1 FY06 compared to the same quarter in FY05. Specialty care setting (Orthopedic and Obstetrics) had higher productivity than the primary care (Family Practice) setting ($F^{2, 8} = 24.92$, $p<.000$). The study also supports the need to have experienced coder-coaches. Coder-coaches with at least six months of coding experience generated higher RVUs (.38 RVUs per encounter in Orthopedic clinic, $p<.01$) than coders in the Obstetrics clinic who had no coding experience ($F^{2, 8} = 49.49$, $p<.000$). Recommendations to the commander include supporting the coder-coach initiative in FY07, hiring only experienced coders, and placing the majority of the coder-coaches in the specialty care setting.

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Introduction

Until the 1980s, cost and fee reporting rather than clinical diagnostic and procedural coding determined the level of reimbursement for a healthcare organization. With the introduction of the Prospective Payment System (PPS), commanders of military treatment facilities (MTF) recognize the effects of coding on the financial health of an organization. Clinical coding not only determines the level of reimbursements but it is also used to determine the resources (staff & supplies) needed to provide the services. In a study to measure variations in coding accuracy, Lorence and Ibrahim (2003), found that almost 87% of respondents (coding auditors), reported significant coding errors in 5% or less of the records audited and about 5% of the respondents reported coding errors existed in 10% or greater of their records. The same study also reported that 14.3% of respondents in an outpatient setting reported a coding error rate of 5% in their records. In a 2004-2005 military health system (MHS) coding audit study conducted by the Health Program Analysis and Evaluation (HPA&E) Department, it was reported that coding accuracy averaged only 27.2% (range:14.50%-42.62%) based on agreement of up to four current procedural terminology (CPT) codes (TRICARE, 2005).

Since the early 1980s, the debate over the trade-offs between health care cost, access, and quality has moved from medical and academic circles to corporate boardrooms, the United States (U.S.) Congress, and state legislatures. Demands for accountability by the individuals and institutions who pay for care have led to a restructuring of health care financing and delivery that have recast the roles, rights, and responsibilities of patients, physicians, private and public purchasers, and insurers. The system-wide transformation that appeared first in the private sector was completely embraced by public payers such as Medicaid and Medicare. In recent years, the MHS has embarked on controlling healthcare costs. In spite of great efforts to manage more efficiently, total spending for the MHS, including the Retiree Accrual Fund, has reached $36 billion in 2005 (Chu & Winkenwerder, 2005). Spending has doubled in the past four years and the program growth is so rapid that it is likely to exceed $50 billion within five years. In order to better manage their budgets, military treatment facilities (MTFs) will have to either reduce their costs or increase revenues through increasing their reimbursable care. The military healthcare costs have been rising and will continue to rise as our nation engages in the Global War on Terror (GWOT). However, the MTFs may be successful in increasing their revenues (reimbursement dollars) through improving the process of coding records so that more encounters are coded in an accurate and timely manner and the numbers of under-coded and over-coded records decrease as a result.

Background

Before the 1980s, the U.S. health care system was comprised of several hundred thousand independent entities. The delivery and financing was primarily held by private entities (Shi & Singh, 2004). Its financing was dominated by an insurance system that not only permitted patients full freedom of choice of providers, but also reimbursed physicians, hospitals, and other providers through a fee-for-service system and paid virtually any price charged for care ordered by physicians. Under this system, all the economic incentives promoted provision of the maximum number of services consistent with the needs of the patient as determined by the physician. Patients were insulated from the actual cost of care because of relatively comprehensive insurance coverage.

The health care system began to change in response to the demand for more accountability by the payers (i.e., businesses, unions, government, and other purchasers of care). At the behest of the payers, insurers began scrutinizing physician and other provider decisions and eventually organized health care networks commonly known as managed-care plans.

According to Shi and Singh (2004), managed care can be defined as "an organized approach to delivering a comprehensive array of healthcare services to a group of enrolled members through efficient management of services needed by the members and negotiation of prices or payment arrangements with providers" (p. 325-326). The transformation of healthcare delivery into managed competition, in which the medical market is dominated by competing managed-care plans, first emerged in California and Minnesota in the mid-1980s and has proliferated to the point where fee-for-service indemnity coverage has been declining in every region of the country. Regardless of source of payment, more care will be financed and delivered in the future by managed-care systems. The growth in managed care has given rise to both a changing mix of health care delivery systems and a plethora of physician compensation formulas. Whereas reimbursements were once driven by fee-for-service arrangements, primary-care physicians and most specialists now face payment schedules that range from full-risk capitation to fee schedules based on Medicare's Resource-Based Relative Value Scale (RBRVS). RBRVS, developed by Medicare under the Omnibus Budget Reconciliation Act of 1989 (OBRA-89), was a new initiative to reimburse physicians according to a relative value assigned to each physician service (Shi & Singh).

The Prospective Payment System (PPS)

Historically, Medicare reimbursed health care facilities on the basis of costs. Because of the rapid rate of growth in inpatient hospital care, Congress first directed implementation of a PPS for acute care hospitals in 1983 with the enactment of Public Law 98-21 (Thompson, 2002). Under PPS, a predetermined payment level is established based primarily upon the patient's diagnosis and services performed by the physician/provider. The hospital receives a set payment; if dollars spent to care for a patient are less than the PPS payment, the healthcare organization gets to keep the extra money and makes a profit on the care provided. If, however, the dollars spent to care for a patient are more than the PPS payment, the healthcare organization may not look elsewhere (i.e., bill someone else) for the additional dollars needed to cover the PPS payment. In this case, the healthcare organization loses money in caring for the patient.

The policymakers also looked to PPS for other types of health care providers. Depending on the type of service setting, there are three main prospective reimbursement systems in use today. These reimbursements may be based on diagnosis-related groups (DRGs), ambulatory payment classifications (APCs), and resource utilization groups (RUGs) (Shi & Singh, 2004). The Balanced Budget Act of 1997 (BBA) (Public Law 105-33) greatly accelerated the efforts by requiring the Centers for Medicare and Medicaid Services (CMS) to replace cost based methods of reimbursement with new PPS for many types of providers operating in the traditional fee-for-service program. The BBA established a demanding schedule for implementing PPS for skilled nursing facilities, hospital outpatient departments, home health agencies, and rehabilitation facilities. Payments for hospital outpatient services, called APCs, were made prospective beginning August 1, 2000 (Thompson, 2002). There are about 450 APCs used to categorize significant outpatient surgical procedures, radiology, and other diagnostic services, medical visits, and partial hospitalizations.

In order to contain costs in the outpatient sector, Medicare implemented a PPS called the Medicare Outpatient Prospective Payment System (OPPS) for services provided in hospital outpatient departments (Shi & Singh, 2004). Other measures (e.g., capitation) emphasized outpatient services in favor of inpatient stays in hospitals. The key data in determining fixed payment rate for outpatient services is the coding and classification of services provided to the patient based on the CPT coding system (CMS, 2005).

Since the implementation of the federal government's first prospective payment system in 1983, there has been a great deal more emphasis placed on medical coding. Currently, reimbursement of hospital and physician claims for Medicare patients depends entirely on the assignment of codes to describe diagnoses, services, and procedures provided. In the 1990s the federal government attacked the problem of healthcare fraud and abuse. As the basis for reimbursement, appropriate medical coding has become crucial as healthcare providers seek to assure compliance with official coding guidelines (American Health Information Management Association (AHIMA), 2005).

Legislative History of RVUs

Since January 1, 1992, Medicare has paid for physicians' services under section 1848 of the Social Security Act (aka the Act), Payment for Physicians Services.

This section provides for three major elements: A fee schedule for the payment of physicians' services; limits on the amounts that nonparticipating physicians can charge beneficiaries; and a sustainable growth rate for the rates of increase in Medicare expenditures for physicians' services (CMS, 2005). The Act requires that payments under the fee schedule be based on national uniform RVUs based on the resources used in furnishing a service. Section 1848(c) of the Act requires that national RVUs be established for physician work, practice expense, and malpractice expense (Federal Register, 2002). Under the formula set forth in section 1848(b) (1) of the Act, the payment amount for each service paid under the physician fee schedule is the product of three factors: A nationally uniform relative value for the service; a geographic adjustment factor (GAF) for each physician fee schedule area; and a nationally uniform conversion factor (CF) for the service. The CF converts the relative values into payment amounts (Federal Register, 2002).

For each physician fee schedule service, there are three relative values: An RVU for physician work, an RVU for practice expense, and an RVU for malpractice expense. For each of these components of the fee schedule, there is a geographic practice cost index (GPCI) for each fee schedule area. The GPCI reflects the relative costs of practice expenses, malpractice insurance, and physician work in an area compared to the national average for each component (Federal Register, 2002). The general formula for calculating the Medicare fee schedule amount for a given service in a given fee schedule area can be expressed as:

Payment = [(RVU work x GPCI work) + (RVU practice expense x GPCI practice expense) + (RVU malpractice x GPCI malpractice)] x CF

Development of the Relative Value System: Work RVUs

The MHS uses only work RVUs to measure productivity of providers. There are approximately 7,500 codes that represent services included in the physician fee schedule. The works RVUs, established for the implementation of the fee schedule in January 1992, were developed with extensive input from the physician community. A research team at the Harvard School of Public Health developed the original work RVUs for most codes. In order to develop these units, that team worked with expert panels of physicians and obtained input from physicians from numerous specialties (Federal Register, 2002). For example, the RVUs for radiology services were based on the American College of Radiology (ACR) relative value scale.

Practice Expense and Malpractice Expense RVUs

The practice expense and malpractice expense RVUs equal the product of the base allowed charges and the practice expense and malpractice percentages for the service. Base allowed charges are defined as the national average allowed charges for the service furnished during 1991, as estimated using the most recent data available. The Social Security Act amendment of 1994 developed a resource-based system for determining practice expense RVUs for each physician service and includes staff, equipment, and supplies used in providing medical and surgical services in various settings. Effective January 1, 1999, a new methodology was established for computing resource-based practice expense RVUs that used the two significant sources of actual practice expense data available- the Clinical Practice Expert Panel (CPEP) data and the American Medical Association's (AMA) Socioeconomic Monitoring System (SMS) data (CMS, 2005). The methodology is based on an assumption that current aggregate specialty practice costs are a reasonable way to establish initial estimates of relative resource costs for physicians' services across specialties.

Current Procedural Terminology

The AMA first developed and published the CPT in 1966. The first edition helped encourage the use of standard terms and descriptors to document procedures in the medical record. It also helped communicate accurate information on procedures and services to agencies concerned with insurance claims and provided the basis for a computer oriented system to evaluate operative procedures. Furthermore, it contributed basic information for actuarial and statistical purposes. The first edition of CPT contained primarily surgical procedures, with limited sections on medicine, radiology, and laboratory procedures. The second edition was published in 1970, and presented an expanded system of terms and codes to designate diagnostic and therapeutic procedures in surgery, medicine, and the specialties. At that time, a five-digit coding system was introduced, replacing the former four-digit classification (AMA, 2005).

In the mid to late 1970s, the third and fourth editions of CPT were introduced. The fourth edition represented significant updates in medical technology and a system of periodic updating was introduced to keep pace with the rapidly changing medical environment. In 1983, CPT was adopted as part of the CMS's Healthcare Common Procedure Coding System (HCPCS). With this adoption, CMS mandated the use of HCPCS to report services for Part B of the Medicare Program. In July 1987, as part of the Omnibus Budget Reconciliation Act, CMS mandated the use of CPT for reporting outpatient hospital surgical procedures (AMA, 2005). Today, in addition to use in federal programs (MHS, Medicare, and Medicaid), CPT is used extensively throughout the US as the preferred system of coding and describing health care services. The following describes the categories of CPT codes (commonly referred to as CPTs):

Category I CPTs describe procedures or services identified with a five-digit CPT code and descriptor nomenclature. Level I HCPCS codes are commonly referred to as CPTs. The inclusion of a descriptor and its associated specific five-digit identifying number in this category of CPT is generally based upon the procedure being consistent with contemporary medical practice and being performed by many physicians in clinical practice in multiple locations.

Evaluation and Management Codes (E&M) are the CPTs between 99201 and 99499. They represent that portion of a healthcare encounter that is not a procedure. They are designed to classify services provided by a privileged provider and are used primarily in the outpatient setting. E&M codes are CPTs (Level I HCPCS), yet are referred to as an E&M instead of a CPT in order to distinguish the difference between evaluation and management services and procedural coding. The level of service is dependent on the complexity of the history, exam, and medical decision making and is independent of the time spent with the patient (US Army Center for Health Promotion and Preventive Medicine (USACHPPM), 2005). An example of E&M coding would be counseling a family member for his/her child's attention deficit hyperactivity disorder care. Here, an E&M would be needed to describe the level of services, since no procedures were performed. Overall, Level I CPTs can be categorized under different services as shown in Table 1.

Table 1

Level I CPTs

Services	CPT Codes
Anesthesiology	99100 to 99140 & 100 to 01999
Surgery	10000 to 69999
Radiology	70000 to 79999
Pathology & Laboratory	80000 to 89999
Medicine	90701 to 99199
E&M	99200 to 99499

Note. From "Coding PE&I Project: Coding: Level I Procedural Codes", USACHPPM, 2005. Reprinted with permission from USACHPPM.

Category II CPTs are used for supplemental tracking of performance measures. The use of the tracking codes for performance measurement will decrease the need for record abstraction and chart review, and thereby minimize administrative burdens on physicians and other health care professionals. The Category II CPTs are intended to facilitate data collection about quality of care by coding certain services and/or test results that support performance measures and that have been agreed upon as contributing to good patient care. Some codes in this category may relate to compliance by the health care professional with state or federal law. The use of category II CPTs is optional.

Category III CPTs are used for temporary set of tracking new and emerging technologies. This CPT category is intended to facilitate data collection and assessment of new services and procedures. The Category III CPTs are intended for data collection purposes in the FDA approval process or to substantiate widespread usage.

Resource-Based Relative Value Scale (RBRVS)

The Health Care Financing Administration (HCFA) implemented the RBRVS physician fee schedule on January 1, 1992 (Harris-Shapiro & Greenstein, 1999). Replacing the Medicare payment system of customary, prevailing, and reasonable (CPR) charges, the RBRVS is derived from the relative value of services provided. It assumes that fees are not determined by the market because Medicare covers all care based on previous charges, so patients were not concerned or even aware of the fees paid on their behalf. Over time, it was determined that the CPR fee schedule was inflationary as well as inequitable. Because the fee schedule was designed to reimburse physicians based on their charges, great variation in levels of reimbursement for each service existed; reimbursement did not adequately reflect the efficiencies that came from performing a service over time. Also, because the CPR system overpaid surgical and diagnostic services, by default, it placed more emphasis on procedural rather than cognitive or evaluation and management services.

In the CMS glossary (2000), RVUs are defined as "a standard for measuring the value of a medical service provided by physicians relative to other medical services provided by physicians" (p.7). The RVUs of each physician service is quantifiable and based on the concept that each service can be broken down into three components: the amount of physician work that goes into the service, the practice expense associated with the service, and the professional liability expense for the provision (Harris-Shapiro & Greenstein, 1999) of the service. The relative value of each service is then multiplied by a geographic adjustment factor reflecting the cost to provide care for each Medicare locality (fee schedule area) and then translated into a dollar amount by an annually adjusted conversion factor. The dollar amount derived from this calculation, with adjustments under certain circumstances, is the reimbursement a physician receives for the provision of a particular service.

In 1988, the HCFA commissioned William Hsiao, a Harvard-based researcher, to develop values for the total work component. The Harvard researcher derived a definition of physician work that included both time and intensity. Time was decomposed into three components: pre-service, intra-service, and post-service, while intensity was decomposed into three dimensions: physical effort and skill, mental effort and judgment, and stress from iatrogenic risk (CMS, 2005, ¶ 6). CPT codes were used along with clinical vignettes designed to describe the typical patient for each service. On average, the physician work component of an RVU, accounts for approximately 54% of the total RVU per procedure; the practice expense component accounts for 41% of the total RVU; and the malpractice component accounts for the remaining 5% of the RVU (Harris-Shapiro & Greenstein, 1999). An example of the breakdown of an RVU is provided in Table 2. Today, the RBRVS reflects the relative amount of applicable resources physicians expend when they provide a service or perform a procedure.

Table 2

Comparison of 2001 RVUs for Common Physician Services

Service	CPT Code	Physician Work	Practice Expense	Malpractice Costs	Total RVUs
Office visit, detailed established	99213	.67	.62	.03	1.32
Office visit, detailed new patient	99203	1.34	.97	.08	2.39
Colposcopy and biopsy	57454	1.27	1.61	.13	3.01
Cardiovascular stress test	93015	.75	2.12	.11	2.98
Initial hospital care	99223	2.99	1.11	.10	4.20
Follow-up hospital care	99231	.64	.28	.02	.94
Inpatient consultation	99254	2.64	1.13	.11	3.88
Obstetrical care: Routine					
prenatal and delivery	59400	23.06	15.03	4.14	42.23
Hospital newborn discharge	99435	1.50	.85	.05	2.40
Cardiac catheter left-sided only	93510	4.33	38.54	2.13	45.0

Note. From "Resource-Based Relative Value Units: A Primer for Academic Family Physicians", Sarah E. Johnson & Warren P. Newton, *Society of Teachers of Family Medicine*, 2002. Reprinted with permission from the Society of Teachers of Family Medicine.

Although designed for Medicare, many non-Medicare payers have adopted the RBRVS as the preferred method for reimbursing physicians. Results from a 1997 AMA survey of more than 161 public and private payers found that more than 61% use the Medicare-based system in at least one product line (AMA, 2005). The RBRVS is being used more frequently in the practice environment as a tool to gauge both productivity and income distribution. In order to succeed in the changing marketplace, a physician must be able to measure the costs involved in providing services. These costs include physician income and benefits, practice expenses, malpractice premiums, and the frequency of services provided. Once this information is determined and the appropriate RVUs for each service are obtained, a physician can calculate the costs involved in the provision of each service, the average cost per service provided, and the per member per month estimates.

Conditions that Prompted the Study

Historically, the military has not placed an emphasis on coding outpatient visits. In 2001, the Air Force Surgeon General (AF/SG) authorized a study to compare how the AF coded outpatient visits in relation to the civilian healthcare sector (Goodale, 2003). The results of the study indicated only 60% accuracy for E&M codes and 40% accuracy for CPT and International Classification of Diseases (ICD-9) codes. The AF/SG also issued a policy on coding improvement initiatives which essentially stated the need to have timely and accurate clinical encounters data to assess the health of population, allocate resources, and support corporate decisions.

In 2004, at the Tricare Management Activity (TMA) annual conference, Lieutenant General (LTG) Kevin Kiley, the Commander of the Army Medical Department (AMEDD) stated, "If it is not documented, it was not performed, and if it was not performed, it will not be reimbursed" (K. C. Kiley, personal communication, January 26, 2004). LTG Kiley was referring to the poor documentation by the providers after each patient encounter and the revenues lost as a result.

The Defense Health Program (DHP) costs continue to rise due to increased utilization of the MHS. The FY 2006 DHP funding request is $19.8 billion for operation and maintenance, procurement and research, development, and test and evaluation appropriations to finance the MHS mission (Chu & Winkenwerder, 2005). The projected total military health spending to pay for all health-related costs including personnel expenses and retiree health costs is $33 billion for FY 2006. The MHS is taking a number of steps to better manage resources. The solutions include implementing performance-based budgeting, focusing on the value of services delivered rather than using old cost reimbursement methods, and starting initiatives to capture workload that is being lost due to poor coding. With the performance-based budgeting the MTF budgets would be based on workload output such as hospital admissions, prescriptions filled, and clinic visits, rather than on historical resource levels such as number of staff employed, supply costs, and other materials.

2005 is the first year of a planned four year transition to the new PPS. The PPS will provide incentives and financial rewards for efficient management (Chu & Winkenwerder, 2005). Many MTFs are embarking upon initiatives to better capture what their providers are doing during each encounter. These initiatives should prepare the MTFs to capture every dollar due to them. In July 2005, the Army Surgeon General informed the commanders of the need to pay close attention to all aspects of coding practices within their commands. Furthermore, he notified them that future direct care funding of an MTF would be directly tied to the coding performance. Poor coding accuracy and inadequate documentation had resulted in an MTF efficiency decrement of $1.07 billion. The decrement for FY06 is estimated to be $29.8 million across the program objective memorandum (POM) (Kiley, personal communication, 12 January 2005). (According to the Acquisition Community Connection (2005), a POM is an official estimated/recommended total resource requirement for programs within the parameters of secretary of defense's fiscal guidance). LTG Kiley also proposed Jumpstart dollars to increase productivity within each MTF through such initiatives, which were to be developed by each MTF and sent to the Medical Command (MEDCOM).

Coder-coach Jumpstart Initiative

TAMC received $3.278 million in Jumpstart funds from MEDCOM to develop 12 Jumpstart initiatives in order to increase the current workload by 69,900 RVUs in FY06. The funds authorized for FY06 will be available in FY07 for similar initiatives if the MTFs are successful in FY06. One of the initiatives is to hire coding coaches and consultants to help providers document patient encounters more accurately capturing more of what the providers truly do. Of the $3.278 million, $624,000 was assigned to the coder-coach initiative and $300,000 to a 3-member consultant team with a goal to increase the outpatient workload by 19,000 RVUs in FY06.The coder-coach initiative will primarily focus on workload lost due to under-coding and over-coding. In recent years, evidence indicates that inaccurate coding of encounters by the providers (i.e., down-coding or under-coding) has resulted in unclaimed reimbursements and lost revenues for a number of facilities (Lorence & Ibrahim, 2003).

Statement of the Problem

Accurate coding is crucial to correctly document, code, bill, and receive reimbursements for the care provided to the beneficiaries. The data collected through coding can be used to improve the assessment and management of the health of the population served, provide evidence-based medicine, and prepare to implement itemized billing. An analysis by the 3M Company (external auditors hired by TAMC in 2005) and TAMC Decision Support Branch (DSB) (Resource Management Division) (RMD), indicates that when compared to the Medical Group Management Association (MGMA) benchmark data, TAMC consistently under-codes for new and established E&M codes. Analysis of year-end encounter data also showed that 1-2% of all encounters remained un-coded. At $67 per average RVU, this equates to a potential increase of $1.27 million in PPS value for FY06 (D. B. Sloan, personal communication, July 08, 2005). The research problem is to investigate whether hiring coder-coaches is positively correlated with improved documentation by providers resulting in increased productivity (measured in RVUs). The assumption of this study is that the coder-coaches will help improve documentation which will allow more accurate capture of provider workload through decrease in number of encounters that are under-coded, over-coded, and/ or un-coded.

Literature Review

Since the implementation of the federal government's first prospective payment system in 1983, there has been a great deal more emphasis placed on medical coding. Currently, reimbursement of hospital and physician claims for Medicare patients depends entirely on the assignment of codes to describe diagnoses, services, and procedures provided. In the 1990s, the federal government attacked the problem of healthcare fraud and abuse. As the basis for reimbursement, appropriate medical coding has become crucial as healthcare providers seek to assure compliance with official coding guidelines. There are many demands for accurately coded data in the medical records. In addition to their use on claims for reimbursement, codes are included on data sets used to evaluate the processes and outcomes of healthcare. Coded data are also used internally by institutions for quality management activities, case-mix management, planning, marketing and other administrative and research activities (AHIMA, 2005). Health information coding is the transformation of verbal descriptions of diseases, injuries, and procedures into numeric or alphanumeric designations. Coding includes assigning the correct CPT codes for E&M services, medical or surgical procedures, and labs or x-rays, capturing all separately billable services provided, and identifying all separately billable supplies and classifying morbidity and procedural data in order to get appropriately reimbursed by the payers.

Physician Productivity

Physician productivity is a measure of the physician's work, with work being measured using one or more benchmarks. Some common work measurements include number of patient encounters per hour, claims and/or charges generated per day, infection rates, length of stay, and RVUs generated per encounter. For this study, RVUs generated will be used to measure physician productivity. Physicians are considered more productive when they generate higher values when measured against these benchmarks and less productive when they don't achieve those standards. Examples of common measures of productivity include the number and types of patient encounters during a given time period in a primary care practices, number of visits for each type of patient (new and established) and level of service, and for surgical specialties, number and types of E&M visits or number of types of surgical procedures performed. Simply counting the number of office visits will not provide a fair analysis of productivity since not every type of office visit is the same. For example, a return office visit for otitis media (ear infection) requires different resources and different intensity than a new office visit for chest pain. Because coding is tied to reimbursement, correct coding of services is essential.

Correct coding becomes even more important when relative value productivity measurements are applied because these are tied directly to the assigned codes. Physicians who under-code or over-code or assign incorrect codes to the services they provide will not have RVUs that accurately reflect the services provided. An advantage of using RVUs is that they are not tied to specific dollar amounts. Therefore, physicians who have different charging structures for their services or provide different types of services can be compared against each other using RVUs. Also, the RVUs take into account varying types of patient encounters and the associated time it takes to provide the various services.

There are a number of factors that contribute to an encounter being coded in a particular way and the value attached to the encounter. When patients are discharged from the hospital, their stays are summarized in their discharge notes completed by their physicians. A discharge note contains special codes for diagnoses as well as procedures that were performed during the hospitalization. These codes are compiled and used for claims for reimbursements from third party payers. The providers complete the discharge summary, to include history and physicals, diagnoses, procedures, counseling, and follow-ups. The providers also document diagnoses as the primary reason for the admission. These diagnoses and procedures are assigned special codes and are stored in the Composite Health Care System II (CHCSII) databases.

Many studies show problems with discharge summaries and how the providers document an encounter. For example, O'Malley, Cook, Price, Wildes, Hurdle, and Ashton (2005) found main error sources to include variance in the electronic and written records, and unintentional and intentional coding errors, such as misspecification and over-coding. Adams, Norman, and Burroughs (2002) concluded the need for physicians to adequately document medical records, appropriately apply billing codes, and accurately charge insurers for medical services as essential to the medical practice's financial condition. Coding that is incorrect or incomplete results in cash flow losses that could reach hundreds of thousands of dollars. This was confirmed by the 3M Consulting Company hired to conduct audits on the quality of documentation within TAMC in 2004-2005 (D.B. Sloan, personal communication, July 08, 2005). Uncovering and correcting coding errors or documentation problems could reduce the potential losses. Adams et al., also noted the Medicare Integrity Program was an example of a guideline used by CMS regulators to identify coding errors during audits and deny payment to providers when improper billing occurred. For each denied claim, payments owed to the medical practice were denied. Physicians, clinicians, and coders all agree that proper documentation is the first step in the smooth transition from transcription to coding, billing, and eventually, reimbursement. Even though everyone agrees that is the case, between 1-2% of records remained un-coded in 2004 and TAMC continues to perform below the MGMA benchmark for under-coded records (D.B. Sloan, personal communication, 2005). In order to improve these deficiencies, the 3M consultants suggested physicians and clinicians correctly and completely document procedures in order to ensure that coders and billers have enough information to code compliantly and bill properly for all services performed.

In 2003, an audit of 2800 physicians conducted by Washington-area Care First Blue Cross and Blue Shield showed nine out of ten claims were inaccurate (Monitor, 2004). Inaccurate coding increases the risk of fines, criminal prosecutions, and administrative exclusions especially when the federal government is the payer (as is the case for Medicare and Medicaid claims). According to Poindexter (2004), in previous audits of E&M codes, the Office of the Inspector General (OIG) found a significant number of improper codes and overpayments. The OIG determined that of the $20 billion overpayment in Medicare payments, 29% were due to improper coding. According to the HCFA and the American Academy of Family Physicians (AAFP), family physicians often under-code for their services, resulting in loss of potential revenues (King, Sharp, & Lipsky, 2001). These poor results were due to incomplete or unclear documentation in the medical record, ambiguities involved in classifying diagnoses, and incomplete coding of co-morbidities (Levy, Tamblyn, Fitchett, McLeod, & Hanley, 1999). As was expected, there were a number of variables that did not affect the accuracy of coding. According to King et al., no statistically significant relations were found between physician accuracy in coding and the following variables: years in practice, physician age, type of practice, formal coding training, hours of training, patient care time, charges for office visits, practice location, or physician determination of the codes during their patients' visits.

Under the traditional method of dictation and transcription, the quality of documentation was dictated by how soon the doctor was able to dictate his/her notes after an encounter. Unfortunately, at most facilities, doctors see one patient after another (outpatient setting) throughout the course of the day and eventually dictate hours later based on recollection or quick handwritten notes. Inevitably, important details and portions of the procedures are lost and so are the opportunities to code and be reimbursed for those details (Levy et al., 1999). Using software to document an encounter immediately after it has ended, at the point of care, solves many of these problems. A software application that prompts clinicians to document immediately and completely and then links codes to the supporting documentation is the best solution. Levy et al. found that the specificity of myocardial infarction codes increased when health records analysts used a simple checklist. Given problems with under coding, over coding, lack of coding, and completeness and legibility of hand-written progress notes (MacDonald, 1999), coding in a electronic format like the CHCSII, along with educating and training providers using coder-coaches and sustainment trainers, could improve the quality and efficiency of completing the discharge summaries. More importantly, accurate documentation would lead to better workload capture measured in RVUs. Therefore, the issue of accurate capture of workload is clinically relevant because it could improve reimbursements to the hospital.

Documentation

The primary purpose of the medical chart is continuity of patient care; medical documentation furnishes the pertinent facts and observations about a patient's health, including past and present history, tests, treatment and medications, and outcomes.

An accurate and complete medical chart protects the patient by providing complete information about the patient's history, current health status, and the effectiveness of past and current therapy. An accurate and comprehensive medical chart can, when necessary, protect the physician in liability actions. The medical chart also provides the information that supports the ICD-9 and CPT/HCPCS codes used to report the services provided and submitted to various payers for reimbursement. Therefore, it is absolutely essential that the medical record, whether office, emergency department, or hospital, be complete and concise (Ericson, 2004). The record should contain all the information regarding the reason the patient presented to see the provider, complete details of the information provided by the patient, a thorough assessment of the patient's conditions, the results of diagnostic, consultative, and/or therapeutic services. The record should also contain other information such as the plan of care for the patient, including advice from other physician specialists, other services, procedures, and supplies provided to the patient, and the time spent with the patient, if counseling or coordinating care was provided. In addition, the medical documentation must be legible and understandable for all providers who care for the patient. If the handwriting of the physician cannot be read, Medicare auditors, as well as other payers, consider the service as not billable (Ericson, 2004).

Because facilities only get reimbursed for what their providers document and not necessarily what the providers actually do, the importance of complete notes from physicians and clinicians is paramount. If a coder has to base his or her code selections on incomplete or inadequate documentation, the result is defensive under-coding and lower reimbursements. In the MHS, where PPS reimbursements are just now being introduced, most physicians aren't aware of the extent to which their documentation determines the amount paid for their services, and coders often end up with notes that must either be under-coded due to missing or inadequate documentation or sent back to the physician for clarification. By automating the process of entering procedure notes, software reduces demands on physicians' and coders' time, while it increases the accuracy and completeness of notes, ensuring the inclusion of all billable services.

Many third party payers have adopted federal guidelines for documentation requirements. Therefore, third party payers also review and audit physician records with the same stringent rules. It is a prudent policy to have providers document to the level of the highest requirements. This is effectively being achieved through the use of CHCSII, which provides to meet some of the data quality requirements like timeliness, completeness, accuracy, and for the providers, ease of use. Education of staff, including billing, coding, physicians, and other clinicians, needs to be an ongoing priority. Similar to other MTFs, TAMC is achieving this goal through mandatory training for all providers. In 2000, a study was conducted to investigate the effect of coder-coaches on improved documentation on coding accuracy in an inpatient setting. Within the first year of the improvement program, the inpatient facility not only showed improved accuracy in documentation but also showed an increase in its net reimbursements by $340,973 (Danzi, Masencup, Brucker, & Dixon-Lee, 2000).

Composite Health Care System II (CHCSII)

The CHCSII is a medical and dental clinical information system that generates and maintains a comprehensive, life-long computer-based patient record (CPR) of all health care (including preventive care) rendered to MHS beneficiaries. CHCSII functions as a global clinical data repository to store live data, a clinical data warehouse to provide fast and efficient query functions, and it provides intelligent automated coding of outpatient encounters capability (Integic, 2004). In order to support the coding process, the system allows encounter coding, automatic calculation of E&M codes, CPT and ICD-9 codes, and it supports itemized billing. Some of the solutions that this system supports include ready availability of charts, well-designed templates for fast and efficient documentation through redesigning Alternate Input Method (AIM) forms, and 100% legible records, a data quality issue with hand written records (Blair, 2004). Its advanced features (e.g., intelligent prompting for reminders, re-use of common text for documentation, automated chart reviewing to indicate evidence-based needs for screening, or therapeutic interventions) is expected to improve the quality of documentation and patient care. According to Integic (2004), the developer of CHCSII system, CHCSII will support about 9 million patients, 150,000 providers, 450 clinics, 105 hospitals, and 40 million outpatient visits each year. The diagram of a typical patient encounter is shown in Figure 1.

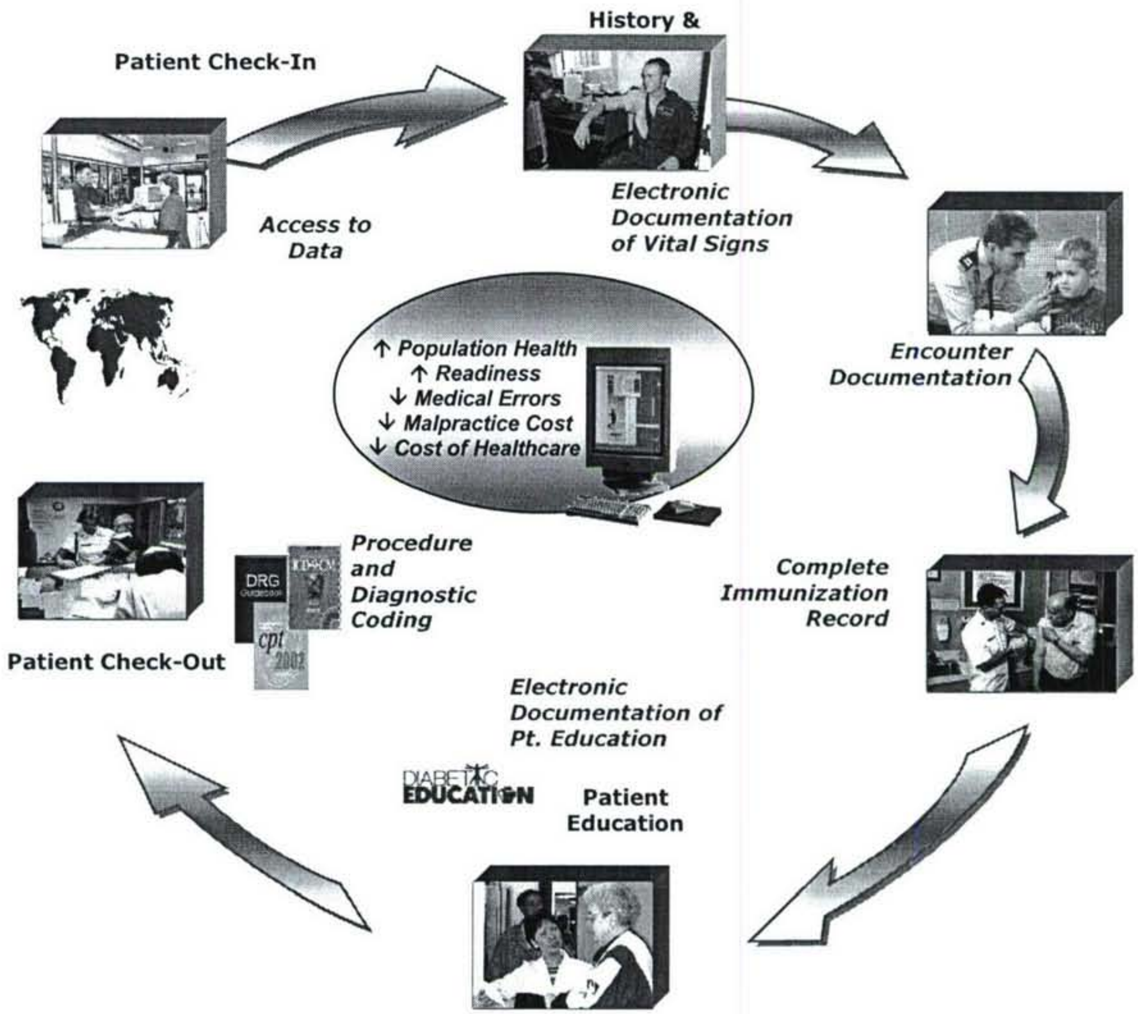

Figure 1. CHCSII Enhances the Entire Patient Encounter.

From "*CHCSII Provider Perspective*", by Dr. Blair Underwood, TAMC CHCSII Demonstration Project, 2005. Reprinted with permission from the author.

Although only select clinics started implementation of CHCSII since May 2005, all providers in clinics that are implementing the coder-coach program have completed CHCSII training (C.E. Lasome, personal communication, 05 August, 2005). In order to encourage MTFs to fully implement CHCSII, a number of metrics have been proposed by MEDCOM, including provider no-show rates for training, weekly reports on training at the provider/clinic/MTF-levels, and the number of actual encounters recorded in CHCSII compared to the legacy CHCSI. These reports are sent to MEDCOM for The Surgeon General (TSG) to review. In his memorandum to all major subordinate commands, TSG noted that he expects the AMEDD leaders to embrace CHCSII as the only corporate longitudinal electronic medical record and optimize its use in the delivery of healthcare in all AMEDD facilities (K.C. Kiley, personal communication, 05 October, 2004). In a memorandum sent to all MTF commanders, TSG (K.C. Kiley, personal communication, 13 January, 2005), proposed the following benchmarks for successful implementation of the CHCSII:

a. MTF training no-show rates less than 5%.
b. Greater than 65% of all outpatient visits (OPV) documented in CHCSII at completion of clinic's initial training.
c. Greater than 75% of all outpatient visits (OPV) documented in CHCSII at completion of MTF's initial training.
d. Greater than 85% of all outpatient visits (OPV) documented in CHCSII six months after completion of MTF initial training.

Compliance programs

To ensure that physicians comply with accurate coding and documentation, many organizations, including TAMC, have emphasized coding education to their providers. In a memorandum signed by Dr. William Winkenwerder (2003), Assistant Secretary of Defense for Health Affairs (HA), Dr. Winkenwerder instructed the establishment of a coding compliance plan within each MTF, to include training and an audit plan to evaluate coding compliance. In order to comply, TAMC opted for both a training program using expert coders or coder-coaches as well as an internal and external independent audit program. The audit and compliance department, consisting of compliance officers and coding professionals (auditors), conduct chart reviews and coding training sessions with the medical staff and their support personnel (McGee, 2005). This department also embraces the idea of having physician leaders involve in conducting E&M coding training. This is expected to achieve the required buy-in from fellow physicians of the importance of training for accurate documentation and coding.

The increasingly prominent role of coding has prompted many health care organizations to retain outside firms to conduct regularly scheduled, periodic, coding audits. The OIG encourages hospitals to conduct such audits and has identified coding audits as a key component of an effective compliance program (Farley, 2003). The purpose of compliance coding audits is to provide hospital management with information that it needs to ensure that a hospital complies with coding guidelines and with government regulations that relate to billing and reimbursement for health care services based on encoded data. Compliance coding audits should be viewed as part of an ongoing process for identifying problems, developing remedial activities designed to fix those problems, and then evaluating the effectiveness of those remedial strategies.

Operational definitions:

In order to investigate the impact on productivity, the variables and their performance measures are operationally defined for the readers.

Relative Value Units (RVUs):

RVUs are the unit of measure for the Medicare RBRVS. An RVU is made up of three parts: work relative values, practice expense relative values, and malpractice relative values. The sum of these values is multiplied by a conversion factor and a geographic adjustment factor to determine a reimbursement rate. According to the Health Economics Resource Centers (2005), the research branch of the Department of Veteran's Affairs, an RVU is a numeric weight assigned to a medical encounter or procedure that provides information on its relative resource use. MHS only uses the work relative value to measure productivity as military physicians do not have practice expenses or malpractice liability expenses. In order to meet one of the key strategic goals of efficiency, MHS will be measuring productivity via two measures- RVU per full time equivalent (FTE) and cost per RVU (Baird & Priest, 2004). For this study, total simple RVU values per month, per clinic, will be used as the measure of productivity. However, the MHS standard of RVU/FTE is easily achievable once RVU data can be obtained at the end of the study. Total RVUs per clinic is the dependent variable.

Coder-Coaches

Hospitals or medical providers report coded data to insurance companies or the government and in the case of Medicare and Medicaid recipients, for reimbursement of their expenses. Thus, coding accuracy is highly important to healthcare organizations because of its impact on revenues and describing health outcomes. Medical coding professionals fulfill this need as key players in the healthcare workplace. Accordingly, TAMC will hire 12 certified professional coders (CPCs) who have passed a coding certification examination sponsored by the American Academy of Professional Coders (AAPC). One of the requirements for the coders is clear demonstration of mastery and proficiency in coding gained through previous experience. According to AAPC (2005, ¶

2) a CPC must have at least two years coding experience and maintain yearly renewal and CEU requirements.

Certified Professional Coders

A CPC is an individual who has achieved a certain level of knowledge and expertise in coding of services, procedures and diagnoses for physician practices. According to the AAPC (2005, ¶ 3), a CPC's main responsibilities include:

- Determining accurate codes for diagnoses, procedures, and services performed by physicians and licensed non-physicians in a physician-based settings. (These services may include E&M services as well as reviewing operative notes.)
- Keeping current with medical compliance and reimbursement policies, such as medical necessity issues and correct coding issues.
- Performing various auditing duties related to physician practice management and coding to maintain compliance with payor reimbursement policies and governmental regulations as well as Medicare/CMS guidelines.
- Monitoring progress resulting from periodic internal audits.
- Providing training in coding and compliance issues to physicians, non-physician providers and staff on an ongoing basis, and
- Providing physicians and staff with up-to-date coding information from reliable, accurate sources, such as specific payors, the AMA, AHA's *Coding Clinic*, and CMS, to name a few.

The coders will be assigned to providers to observe them while they render services during an encounter in different patient care settings. One of the most beneficial methods of educating physicians regarding documentation, coding, and compliance is through shadowing them during encounters (Gilbert, 2003). There are numerous benefits associated with coders shadowing the providers. These include providing feedback on subjects such as streamlining documentation through template redesign and failure to capture workload that is billable. By allowing the coder to physically watch the patient care workflow, the feedback can help the providers with time saving suggestions and more importantly, it can affect the hospitals' bottom-line profit margins by increasing reimbursements through the recapture of lost workloads.

To perform the required tasks, coders must possess expertise in the CPT coding system. The specific tasks of coder-coaches at TAMC include (M. Cheo, personal communication, 29 August, 2005):

1. Review and assign procedural and diagnostic codes for TAMC clinic encounters, according to guidelines set forth in the CPT, the HCFA Guidelines for Teaching Physicians, and DoD Coding Guidelines.
2. Perform auditing duties related to physician practice management and coding to maintain compliance with payer reimbursement policies and governmental regulations as well as Medicare/CMS guidelines.
3. Review and assign procedural codes for third party encounters, which will be based on Hawaii third party payer policies and/or appropriate payer guidelines.
4. Review and validate TAMC services, including emergency department visits, procedures, and ancillary services to establish accurate payment.
5. Determine accurate code procedures and services performed by physicians and recognized, licensed, non-physician providers in physician-based settings. These services may include E&M services as well as reviewing operative notes. Duties also

include coding, documentation, and compliance education for TAMC providers and staff, in accordance with and in support of the DoD Compliance Plan.

6. Monitor progress resulting from periodic internal audits, provide training in coding and compliance issues to physicians, non-physician providers and staff on an ongoing basis.

7. Provide physicians and staff with up-to-date coding information from reliable, accurate sources such as specific payers, the AMA, the American Hospital Association's (AHA) Coding Clinic, and CMS, and provide orientation training to include medical practice guidelines for new physicians and non-providers to the practice.

8. Implement new coding guidelines in a timely manner within the practice.

9. Update encounter forms on an annual basis with respect to diagnostic, procedural, and supply code changes and update other patient information forms as necessary from time to time.

10. Review explanations of benefits from payers, evaluating denied claims and filing appeals for denied claims.

11. Serve as the clinic POC to represent revenue cycle management/coding issues and track down/communicate/teach solutions as necessary, and

11. Collect revenue management cycle issues, questions, research solutions, and proper procedures; develop classes or short training sessions to address most common problems.

The performance of the coder-coaches will be measured through RVUs per encounter data generated by dividing the total simple RVUs per clinic per month by the total number of encounters generated in the clinic during the same month. As the quality of documentation will improve through coding accuracy and better documentation (i.e., procedures, tests ordered, and consults), the number of RVUs earned per encounter is likely to go up. In order to find the mean differences in productivity (RVUs per encounter) due to the effects of education (certification) and work experience of coder-coaches, the study will also conduct a one-way analysis of variance testing. Work experience will be coded as 1= coder-coaches have no experience (no experience), 2 = coder-coach have less than 6 months but greater than 0 months coding experience (partial experience), and 3 = coders have greater than 6 months coding experience (full experience). Certification, if any, will be coded using a binary measure with 1 representing coder-coach is a CPC and a 0 representing that the coder-coach is not certified.

Sustainment Trainers

A sustainment trainer (ST) provides CHCSII users with tips, tactics, and tools to enable them to completely document a patient encounter within a limited encounter time frame (usually about 15-20 min). An ST also ensures that (1) providers become skilled in the use of CHCSII to the degree that documentation and encounter coding is completed by the end of the patient encounter and (2) they optimize CHCSII templates and AIM forms to support such efficiencies.

According to Lasome (personal communication, 05 August, 2005), Chief of the Clinical Information Technology Program office (CITPO) at TAMC, the scope of work of an ST primarily includes, providing pre-implementation CHCSII clinic preparatory support and CHCSII sustainment training. Secondary duties include management and reporting, customized AIM form development to meet end-user requirements consistent with AMEDD policies and procedures, and support to the MTF's clinical workflow processes resulting in optimized use of CHCSII for the documentation of clinical encounters by all staff. The ST also provides timely, accurate, and customized end-user support through a help-desk. For example, the help-desk provides quick response (usually less than 24-hours) to a provider's request for customized documentation template re-design. According to professional requirements (C.E. Lasome, personal communication, 05 August, 2005), STs must:

a) Possess an in-depth knowledge level of clinical processes used across TAMC and integrate and support those processes in the context of an electronic documentation environment generally and with CHCSII specifically.

b) Develop customized and clinic-specific classroom and over-the-shoulder training materials for each of the roles within the various clinical practice areas to include integration of all new releases of CHCSII functionality. Implement an ongoing evaluation and updating of training materials to ensure currency and accuracy.

c) Maintain and evaluate the use of CHCSII for documentation of the patient encounters to meet AMEDD specific goals for general use of the electronic health record (EHR) while ensuring compliance with relevant policies and procedures.

d) As required by clinics or providers, develop and construct AIM forms to support accurate, complete, and efficient use of the subjective and objective portions of a SOAP (Subjective, Objective, Assessment, & Plan) note used by providers to document daily patient care notes.

e) Instruct users on the proper means to combine subjective and objective note templates with assessment and plan templates to create a complete encounter template for use in documenting in CHCSII.

f) Collaborate with coding personnel to integrate clinical documentation with appropriate coding knowledge to ensure accuracy of coding at the clinic/user level.

Two full time equivalents (FTE) CHCSII STs will support the CHCSII implementation at TAMC. The STs will be responsible for fully training the new coder-coaches and provide training for all newly assigned providers to TAMC. STs will be paired with professional coders and will operate as a team in supporting end users. The variable ST will be operationalized by a binary measure with 1 representing clinics that opted for designing/redesigning their AIM templates and a 0 representing the clinics that did not opt for designing/redesigning their AIM templates. Documentation is time consuming and burdensome. The AIM template allows providers the flexibility to design/redesign their documentation templates. The ST works with the coders to observe the physicians' methodologies and then redesign their AIM templates to maximize documentation efficiency (Gilbert, 2003). Theoretically, this redesign of templates will improve the accuracy of documentation and result in better capture of workload.

Data Quality (Timeliness)

Routine databases containing large amounts of clinical data represent a tremendous opportunity for the evaluation of health care practices and outcomes. However, data collected for administrative purposes have limitations in content, accuracy, and completeness. The DoD has realized the importance of data quality in recent years and has imposed guidelines on data quality management. Timeliness is defined as "the degree to which specified data values are up to date" (DoD, 2005, p.3). In other words, timeliness is a currency measure. The costs of incomplete or inadequate data can be steep. Problems with incomplete data can lead to tangible and intangible damage, ranging from loss of confidence in data to lack of ability to meet the MTF's mission. The results of whether encounters were coded on time are reported by each MTF to the Patient Administration Systems and Biostatistics Activity (PASBA). In 2003, Dr. Winkenwerder (TSG), provided standards for coding in Army MTFs. One of the standards relates to timeliness of coding encounters. This standard states that 100% of all outpatient encounters, except ambulatory procedure visits (APVs), will be coded within 72 hours or three business days of the encounter. This standard will also be the performance measurement.

Number of Encounters:

The variable, number of encounters, measures the total encounters per clinic per month. Although the data are straightforward, one must understand the expected relationship between volume of workload and the complexity of care and how the unexpected relationship could indicate inaccurate coding. The normal or expected encounters in a MTF include either low volume and high RVUs or high volume and low RVUs (PASBA, 2005). A low volume but high number of RVUs is the result of complex cases; A high volume but low RVUs is the result of (straightforward) routine cases as shown in the matrix in Figure 2. The matrix indicates that the result of high volume and high RVUs could potentially be due to over-coding or poor workload reporting. Similarly, low volume with a low RVU value could potentially be due to under-coding, demand mismanagement, or provider mis-allocation in the clinic.

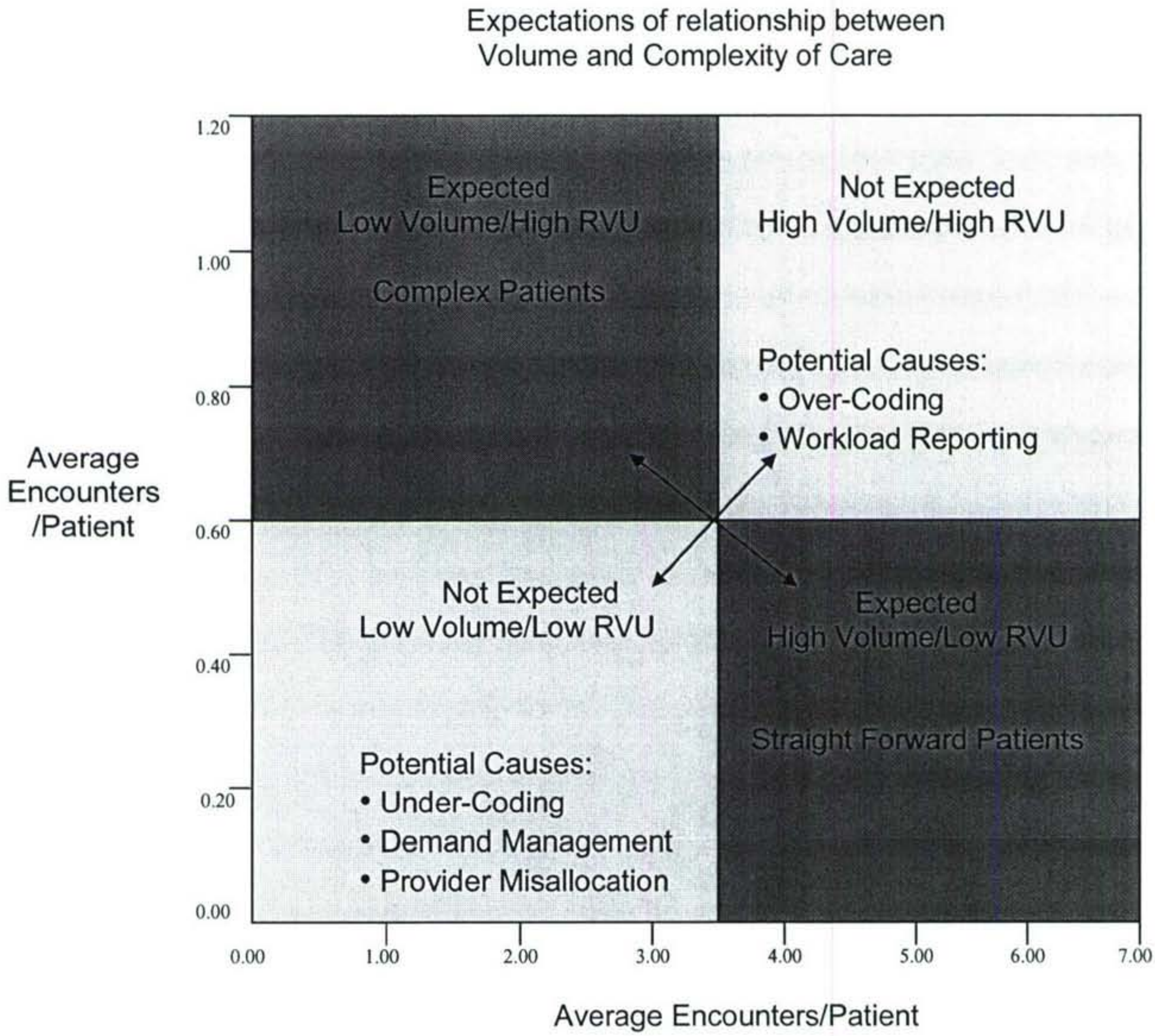

Figure 2. Relationship between volume and complexity of care.

From "*Clinical Operation Metric FY05 (Volume vs. Complexity)"*. PASBA, 2005. Reprinted with permission from PASBA.

Available Patient Care Hours

The number of hours available per clinic is the last independent variable for this study. Each clinic has a set number of providers who, in turn, have a set number of hours to provide patient care. The providers use an automated system to track their time utilization, including time spent on patient care. The system is called the electronic

Uniform Chart of Accounts for Personnel (eUCAPERS) and is a component of the Medical Expense and Performance Reporting System (MEPRS) which tracks personnel time utilization (eUCAPERS, 2005). Time is listed as the type activity performed (e.g., clinic, inpatient, observation visits, and Ambulatory Procedure Visits (APVs). Only time spent in a clinic for outpatient visits is included in the data for the current study. The performance measure for the variable, available patient care hours is the total number of hours available for patient care for each clinic per month.

Purpose of the Study

The purpose of this study is to investigate the impact of coder-coaches on productivity, measured in RVUs, during the quarter beginning October 01, 2005, and ending December 31, 2005. This study is important for TAMC as the Jumpstart funds for FY07 are dependent upon the results generated by Jumpstart initiatives in FY06. The coder-coach initiative is one of the jumpstart initiatives expected to improve the RVUs in FY06 by 3.5%. Besides investigating the effect of coder-coaches on RVUs, the study will also look at the effect of other variables, such as sustainment trainers, data accuracy, data timeliness, number of encounters, and number of hours available on total RVUs, at each of the three clinics. The study hypothesizes that coder-coaches have a positive relationship with RVUs, meaning a coder-coach program within a clinic will result in an increase in the RVUs the clinic generates through improved documentation and accuracy of coding by providers. Similarly, sustainment trainers, number of encounters, and number of provider hours available to see patients are also hypothesized to have a positive relationship with RVUs. The variable, data timeliness, is expected to show a negative relationship. The longer the providers take to code, complete, and close out an encounter, the longer the processing time and the lower the generated RVUs for the month. Increasing the volume of patients seen in a clinic and number of hours available for appointments should increase the RVUs generated in each clinic. The study hypothesizes that there is a difference in the workload (RVUs) of three quarters to include the first quarter of FY05 (baseline), the fourth quarter of FY05, a period during CHCS implementation in various clinics, and the first quarter of FY06, the period after coder-coach program was initiated. The author intends to show that there is a difference in productivity at the clinics in the quarters before and after the coder coach program was started.

Methods and Procedures

Conceptual framework

In order to conduct a conceptual framework analysis, the study uses cost, access, and quality (triad) as the framework (see Figure 3). According to Shi & Singh (2004), these three interrelated elements are the major cornerstones of healthcare delivery. There are many perspectives, which can be used to analyze cost function in healthcare.

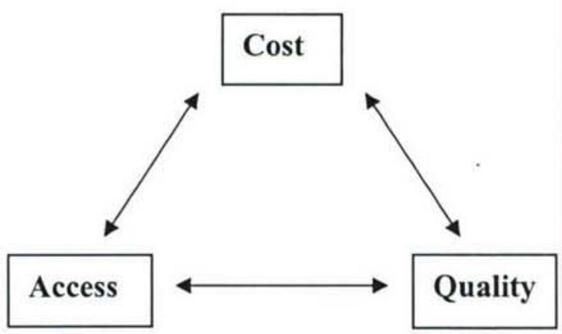

Figure 3. Cost, access, and quality triad of healthcare delivery.

Cost: The study will look at the total cost of purchasing services of 12 coder-coaches and a 3-member team of audit consultants from 3M Health Information Management Company (HIMC). The total cost to hire 12 coder-coaches and 3M consulting services is estimated at $924,000 ($624,000 and $300,000 respectively). As discussed earlier, the $3.278 million in funds for the Jumpstart initiatives were authorized by MEDCOM and will be utilized only for the intended purpose of generating additional RVUs.

Access: According to Shi & Singh (2004), access to care is defined as the ability to obtain needed, affordable, convenient, acceptable, and effective personal health services in a timely manner (p. 505). Access, when considered a key determinant of health, a significant benchmark in assessing effectiveness of medical care delivery system, and an important measure of equitable delivery, is a very important implication for health and healthcare delivery in the United States. According to Penchansky and Thomas (1981), access to care consists of five dimensions: availability, accessibility, accommodation, affordability, and acceptability. Availability is the fit between service capacity and individual's requirements (i.e., transportation, language, and 24-hour service). Accessibility looks at the location of providers and patients (i.e., convenience and payment options). Affordability refers to individual's ability to pay (i.e., premiums, and deductibles) and accommodation is the fit between how resources are organized to provide services and the individual's ability to use the arrangements (i.e., ability to schedule appointments, and office hours). Finally, acceptability refers to the attitudes of patients and providers (i.e., waiting times for scheduling appointments). In order to analyze the affect of the coder-coaches on access, this study will use the ability of patients to schedule appointments as a measure. The changes made in the templates for documentation will allow the providers to document encounters more efficiently and save time. The time saved can be effectively used to increase the number of appointments, increasing access.

Quality: The Institute of Medicine (IOM) defines quality as the "degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (IOM, 1996, ¶ 3). This definition focuses on the perspective of individuals and populations with the ultimate goal of desired health outcomes. This study will look at the microview dimension of healthcare quality, in particular the clinical aspects of delivery. According to Shi & Singh (2004), the clinical aspects of care deal with technical quality, which evaluate the appropriateness of care according to several criteria to include where care is delivered, qualifications and skills of caregivers, the processes and interventions used, cost-efficiency of care, and the end-results of patient health. In order to analyze the end-result or the outcome of health delivery, a number of measures are available. These include mortality and morbidity rates, rates of rehospitalization, and patient satisfaction. In order to measure the clinical aspect of delivery, this study will look at the both the overall patient satisfaction due to increased access and the time spent dealing with patient problems.

Research Design

Experimental designs are especially useful in addressing evaluation questions about the effectiveness and impact of programs (Cooper & Schindler, 2003). The use of comparison data for interpreting findings will allow the experimental design to increase the confidence that observed outcomes are the result of a given program instead of some extraneous variables or events. For example, experimental designs might help answer questions such as is the total quality management program at TAMC having a positive impact on quality of healthcare delivery and will the use of coder-coaches improve the coding accuracy and documentation resulting in increased RVUs?

The different types of experimental designs vary widely in their power to control contamination of the relationship between independent and dependent variables (Cooper & Schindler, 2003). The three widely accepted experimental designs include-pre-experimental, true-experimental, and quasi-experimental (field experimental) design. In order to meet the requirement of a true experimental design, there must be control groups and randomization of the sampling group(s). Both the pre-experimental designs and the quasi-experimental designs lack randomization. Because this study uses a pre-test, intervention, and post-test sequence of testing data, a non-equivalent group quasi-experimental design will be used. Quasi-experimental design is most frequently used when it is not feasible for the researcher to use random assignment. A non-equivalent group design is the most frequently used design and is structured like a pretest-posttest randomized experiment, but without the key feature of random assignment. This study is quasi-experimental because it lacks randomization of the samples since the sample clinics were chosen based on the highest predicted PPS value achievable in FY06 (as shown in Table 3). The non-equivalent group design has the limitation of poor internal validity threat of selection (i.e., prior differences between the groups may affect the outcome of the study).

Setting

The study will be conducted at three clinics, Obstetrics, Family Practice, and

Orthopedic, located at TAMC (Hawaii). The clinics were chosen based on highest forecasted PPS value during FY05. Table 3 shows the seven highest revenue leading clinics at TAMC based on FY05 data and the RVUs generated in FY04 & the first 2 quarters of FY05 (D.B. Sloan, personal communication, 08 July, 2005).

Table 3

Potential clinic revenue leaders, TAMC

			(October-March 2005)		
Clinic	FY04 RVUs	FY04 Enc	FY05 RVUs	FY05 Enc	FY05 PPS
Obstetrics	38,132	45,710	14,213	18,140	$1,997,713
ED	39,805	44,600	21,568	21,118	$ 819,452
Family Practice	35,883	60,396	14,958	27,836	$ 761,433
Orthopedic	13,733	17,515	8,881	8,514	$ 662,980
Gynecology	24,381	19,980	9,606	8, 657	$ 645,834
Cardiology	12,071	16,112	6,559	7,438	$ 577,040
General Surgery	11,980	10,462	6,381	4,455	$ 484,016

From "*RVU-Coder-Coach Program*". TAMC, Patient Administration Division, August 19, 2005. Reprinted with permission from the Patient Administration Division, TAMC.

Based on the FY05 PPS data, the Obstetrics, Family Practice, and Orthopedic clinics were chosen for the study because they showed the highest potential for RVU production. The author also wanted a primary care clinic (Family Practice) and at least one specialty care clinic (Orthopedic & Obstetrics) as the setting for the study. The two types of settings have a different case mix of patients, different procedures performed, different documentation template requirements in CHCSII, and different staff support for the providers. These clinic specific operational differences could potentially be some of the other factors affecting RVUs and are not being studied here. The Emergency Department (ED) was not chosen because all encounters are coded remotely by contractors. Baseline RVUs for the 12 months prior to starting the coder-coach program will be collected and compared to the data collected over the quarter with the coder-coach program from three clinics.

Methods

Once the coder-coaches are hired, they will undergo accelerated two-week CHCSII familiarization training and then immediately start coaching providers in the selected clinics. The coders will provide one-on-one and over-the-shoulder training to providers for two weeks. According to the guidance provided by Major Miller, Chief, Coding and Training section, U.S. Army, at PASBA (personal communication, 20 September, 2005), once the training is complete, one coder per 20 providers will be assigned to the clinic to assist providers. This initiative is expected to generate an additional 19,000 RVUs in FY06 (a 3.5 %). The contract cost for the coder-coach initiative is estimated at $924,000 per year and at average revenue of $67 per RVU, the initiative is expected to generate approximately $1.27 million in revenue (D.B. Sloan, personal communication, 8 July, 2005). The goal for the first quarter (the timeline for this study) is 4750 RVUs or $318,250 in revenue. The STs will assist providers to design/redesign their documentation templates to allow more efficiency during documentation.

Instruments

Data for this study were gathered from three sources. The MHS Data Mart or Management Analysis and Reporting Tool (MART), also known as M2, is an ad-hoc query tool used to obtain information on population, clinical, and financial data from all MHS regions. The Data Mart includes MTF, purchased care, and eligibility and enrollment data (Health Affairs, 2005). The MART provides data to end users to assist them in proactively managing and making decisions within their respective departments, clinics, medical activities, and medical centers. The MHS Data Repository holds all the business data for the MHS. The M2 will be used to retrieve RVU data for the three clinics under study, both before and after the implementation of the coder-coach initiatives; M2 will also be used to retrieve total number of encounters in the three clinics.

The data on STs, which measures whether clinics chose to design/redesign documentation templates, will be gathered from the clinic chiefs or designated clinic points of contact. The database from the PASBA will be used to retrieve the data on data quality variable of timeliness. The total hours available per clinic to see patients will be retrieved from TAMC's Operational Metrics (OM) database which is managed by the data managers at Resource Management Division (RMD). This database was developed internally almost two years ago at TAMC to measure productivity of each clinic by individual provider. The database retrieves RVUs, encounters, and hours available from M2 and then uses the data to compute provider-level statistics. Table 4 shows a summary of variables and sources used in this study.

Table 4

List and description of variables and sources of data

Variables	Description	Data codes	Data source
Dependent variable:			
Relative Value Units	Raw value of RVUs as recorded in M2, per clinic	Raw Value of RVUs	M2
Independent variables:			
Coder-coaches	RVUs per encounter	RVUs/ encounters	M2
Sustainment Trainers	If clinic re-designed document templates	1= Yes 0= No	Clinics
Data Timeliness	% of records that are completely coded within 3 business days of encounter, per clinic	% complete records	PASBA
Clinic Encounters	Number of patient encounters recorded in M2, per clinic	Patient encounters	M2
Clinic hours available	Current total hours available for patient care, per clinic	Hours available	OM

Note. M2= Military Health System Data Mart

PASBA= Patient Administration Systems and Biostatistics Activity

OM= Operational Metrics

Statistical Techniques

A multivariate linear regression analysis will be conducted, using Statistical Package for Social Sciences software, version 11. The regression analysis will measure the effects of coder-coaches, STs, data timeliness, total encounters, and hours available for patient care on the dependent variable, RVU. The following multiple regression equation will be tested:

$Y= a+ b_1X_1+ b_2X_2+ b_3X_3+ b_4X_4+ b_5X_5$

Where, Y= dependent variable, RVU

a= constant

X_1= independent variable, coder coaches

X_2= independent variable, sustainment trainers

X_3= independent variable, data timeliness

X_4= independent variable, clinic encounters

X_5= independent variable, clinic hours available

An *F*-test will be used to test the significance of the regression model as a whole. The study also uses the analysis of variance (ANOVA) to compare three group means for each of the three clinics: the first quarter FY05 (October-December, 2005) where CHCSII had not been implemented at TAMC, the fourth quarter of FY05 (July-September, 2005), a period during which CHCSII was being implemented and before the coder-coach program began, and the first quarter FY06 (October-December, 2005), a period after implementing the coder-coach program. Third quarter of FY05 was skipped primarily because of partial implementation of CHCSII in some clinics during this quarter. The sample size contains 15 months of data for each of the three clinics (45 records). The alpha probability will be set at .05 (5%). If probability (F) < 0.05, the model will be considered significantly better than would be expected by chance and we can reject the null hypothesis of no linear relationship of Y (dependent variable RVU) to the independent variables.

Hypothesis

Null:

H_{o1}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Obstetrics Clinic.

H_{o2}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Family Practice Clinic.

H_{o3}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Orthopedic Clinic.

Alternate:

H_{a1}: There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Obstetrics Clinic.

$H_{a2:}$ There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Family Practice Clinic.

$H_{a3:}$ There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Orthopedic Clinic.

The clinics will also be compared within to see if other unique factors may affect the RVUs in each clinic. Using ANOVA and the multivariate regression techniques should provide evidence of the difference in productivity among the three quarters being investigated and also provide evidence of the relationship of the variables to RVUs.

Analysis Framework

The implementation of the coder-coach program will be analyzed using effectiveness and efficiency analysis. Efficiency will be measured using a simple cost-benefit analysis of the coder-coach initiative. Robbins (2003) defines effectiveness as "achieving the goals and efficiency as the ratio of effective output to the input required to achieve it" (p. 23). In this study, TAMC would achieve effectiveness and be successful if it achieves its goal of transferring inputs (coder-coaches) to outputs (higher RVUs) and achieve efficiency if the initiatives are achieved at a lowest cost. The study will measure productive efficiency by measuring RVU/FTE, a standard MHS measure of productivity (Baird & Priest, 2004). In order to study the effectiveness of the coder-coach initiatives, the outcomes of the study will be evaluated. Effectiveness will simply be measured as whether the three clinics can achieve the required 3.5% increase in their productivity. According to Aday et al. (1999), outcomes research can be defined in two ways: one representing a population perspective or a macro-level and the other a micro-level or a clinical perspective. The focus of the analysis will be the micro-level which will measure the improved access for TAMC beneficiaries and improved coding and documentation by providers. Access will be measured using the AMEDD's Provide-Level Patient Satisfaction Survey (PLPSS). The PLPSS is designed to give individual providers and MTF commanders timely and actionable feedback from their patients. Patients are randomly selected and asked to complete one of either a 9-question Interactive Voice Response (IVR) survey or a 21-question written version survey. All patients have the option of completing the survey on-line. Surveys are normally mailed-out within 48 hours of the date/time of the patient's appointment (Office of the Surgeon General, 2006). All participating providers are granted access to these reports as well as MTF commanders and select MTF staff. Responses to two questions will be used. Overall satisfaction questions ask the responders to choose their overall satisfaction of their last visit on a five-point Likert scale (Completely dissatisfied, Somewhat dissatisfied, Neither dissatisfied nor satisfied, Somewhat satisfied, and Completely satisfied) and the question on accessibility looks at the availability of appointments on a three-point Likert scale (A big problem, a small problem, or not a problem).

Efficiency, according to Aday et al. (1999), "requires that the combination of goods and services with the highest attainable total value be produced, given limited resources and technology" (p. 35). Efficiency can be allocative or productive efficiency; the study will focus on productive efficiency. Productive efficiency refers to producing a given level of output at a minimum cost (Aday et al.). In this study, the primary output is provider productivity, measured as RVUs/encounter. Production efficiency addresses whether resources are organized and managed in ways as to minimize the cost of production and whether personnel (coder-coaches, sustainment trainers, and consultants), supplies, and equipment are paid for at rates that represent their costs in their next-best alternative use. The efficiency can also be assessed at a macro and micro-level. This study will focus on the micro-level efficiency, which uses cost-benefit analysis; cost-benefit analysis can be used to determine whether a program is worth implementing if the benefits of a program are greater than the costs (Aday et al.).

Expected Findings

Results are expected to show that the independent variables: coder-coaches, STs, number of encounters, and time available for patient care will adequately explain the variance in provider productivity, RVUs. The independent variable, data timeliness, is likely to show a negative relationship with productivity as explained earlier. The study expects to find differences in productivity among clinics after implementation of coder-coach initiatives. The author can also safely expect that the clinics might not be as productive early into the implementation since the coder-coach program is new and has not been pre-tested. The coder-coaches and the providers have a large learning curve as the coders have to learn the CHCSII system before they can coach and the providers have to change the way they have documented in the past. However, as discussed earlier, similar coding coach programs have shown positive results in the civilian sector (Danzi et al., 2000). The productivity is likely to be higher in specialty care setting and in clinics with more experienced coder-coaches.

Validity and Reliability

According to Cooper & Schindler (2003), validity refers to the extent to which a test measures what we actually wish to measure and reliability measures the accuracy and precision of a measurement procedure. RVU data is universally used throughout the MHS to make decisions and conduct research in areas of provider productivity, efficiency, and cost-revenue comparisons. The data will be acquired from the M2 system, a standard data mart in the MHS (Health Affairs, 2005). This supports the content validity in the study defined by Cooper and Schindler as "the degree to which the content of the items adequately represents the relative items under study" (p. 232). Similarly, content validity can also identified because of the use of other standard data in the study. For example, the number of encounters recorded in the CHCSII are locally captured in the patient appointment system (PAS) database and then pushed through to the M2 system at the end of the business day. The number of encounters can be acquired from the M2 Data Mart. Content validity is also achieved by accessing timeliness of coding of the data from the PASBA site, a division of the Program Analysis and Evaluation (PA&E) Directorate, MEDCOM. All MTF patient administrators and other personnel can access this site to obtain information regarding: regulation updates, procedural guidelines, directives, diagnostic coding and procedure changes, data quality initiatives, and other patient administration-related activities (PASBA, 2005).

Reliability is the degree to which a measure provides consistent results (Cooper & Schindler, 2003). The data used for the variables is extracted from standard systems used in the MHS (i.e., M2 & PASBA). The consistency of the data ensures reliability of data. The same data are used by other investigators in the MHS to conduct studies on measures such as productivity, costs, and revenues. The total cost of the initiatives, the potential revenues, and similar data specific to TAMC were provided by RMD, PAD, and Managed Care Division of TAMC. The same data were provided to the various committees and senior-level executives and the commander of TAMC. Therefore the data is assumed to be reliable for consistency and accuracy.

Results

Descriptive statistics summarizing relevant characteristics of productivity at three clinic settings in the sample are provided in Table 5. The results show that these two specialty clinics generate higher RVUs per encounter, as indicated by the mean values for the coder coaches. The Orthopedic Clinic generated the highest RVUs out of the three clinics studied with 1.08 RVUs per encounter followed by the Obstetrics Clinic at .99 RVUs per encounter. The Family Practice Clinic generated a little over half of what the specialty clinic at .57 RVUs per encounter over the last 15 months. This trend is in line with the physician productivity levels in primary care and specialty care settings as reported by the Medical Group Management Association (MGMA). According to MGMA's 2003 survey (MGMA, 2004), the median RVUs/encounter for Orthopedic services were 2 RVUs/encounter, Obstetrics, 2.04 RVUs/encounter, and FP services, 1.06 RVUs/encounter. Descriptive statistics for the model are displayed in Table 5 which shows the means and the standard deviations of the variables.

Table 5

Productivity measurements of the Obstetrics, Family Practice, and Orthopedic clinics

	OB Clinic		FP Clinic		Ortho Clinic		Total Sample	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
RVU	2409.77	301.96	2627.83	283.77	1526.70	394.14	2188.10	579.53
Coder-Coaches (RVUs/encounter)	.83	.08	.57	.04	.95	.12	.78	.18
Sustainment Trainers	.40	.50	.46	.51	.33	.48	.40	.49
Data Timeliness	.65	.08	.80	.05	.59	.09	.68	.11
No. of Encounters	2897.86	192.06	4540.06	312.79	1590.26	281.49	3009.40	1248.04
No. Hrs Available	1553.6	135.53	1955.80	247.35	1233.53	196.39	1580.97	356.21

Note: Based on data from October 2005 through December 2006. (For operational definitions and unit of measurement of variables see Table 4).

Test of Model Specification

Correlation (Pearson's) results showed a modest to strong correlation of the variables with the dependent variable, RVUs; the results are presented in Table 6. The results showed a very strong correlation between number of encounters and coder-coaches (81.1%), number of encounters and data timeliness (73.3%), and number of encounters and number of hours available (88.2%). Because of the high correlation, the author decided to continue the study without the variable, number of encounters, as an independent variable.

Table 6

Correlation (*r*) between productivity (RVUs) and coder-coaches, sustainment trainers, timeliness of data, and number of hours available for patient care

Variables	1	2	3	4
Coder-coaches (RVUs/ encounter)				
Sustainment trainers	-.007			
Data timeliness	-.559*	-.005		
No. of hours available	.698*	.101	.643*	
No. of encounters	.811*	.081	.733*	.882*

Note. *$p < .01$

Table 7 presents results of hierarchical multiple regression analysis that evaluated the degree to which the model of productivity (RVUs) was appropriately specified. Table 7 also presents the effects on productivity, represented by RVUs that are uniquely attributable to the independent predictor variables of coder-coaches (RVUs per encounter), sustainment trainers (ST), data timeliness, and available clinic hours. The full-model regression equation was developed using all independent predictors and accounted for 66.73% of the variance in productivity among the population of clinics studied ($F^{4, 40} = 20.06$, $p<.000$). To assess the effects of the specific independent variable sets, each in turn was tested for significance while holding constant the effects of the remaining predictors in the equation. This allowed for the computation of the unique contribution of each set of predictor variables to the total variance accounted for. As indicated in Table 7, three of the five independent variables, coder-coaches, data timeliness, and available clinic hours accounted for a statistically significant increase in the explained variance in productivity in the clinics. The full regression equation yielded an R^2 of .667 and an adjusted R^2 of .634. This was evidence of an appropriately specified model with a strong goodness of fit. The results do not show the importance of the independent variables, but provide evidence that, as a group, the independent variables specified explain over 66% of the variance in productivity in the chosen sample. Results of the hypothesis test for the coder-coach predictor indicated that 7.91% of the productivity variance could be accounted for, with $F^{1, 40} = 9.52$, p=.004. Available clinic hours accounted for highest variance in productivity at 27.03% ($F^{1, 40}$ = 32.49, p<.000). Both sustainment trainers and data timeliness accounted for less than 1% of the variance in productivity with $F^{1, 40} = .53$, p= .168 and $F^{1, 40} = 4.85$, p< .03, respectively.

Table 7

Hypothesis tests of effects on RVUs uniquely attributable to independent variables

Effect Tested	R^2 Full Model	R^2 Reduced	Variance Uniquely Explained	*df 1*	*df2*	*F*	*p*
Full Equation	.66733	.00000	.66733	4	40	20.06	.000
Coder-Coaches	.66733	.58818	.07915	1	40	9.52	.004
ST	.66733	.66285	4.48^{-03}	1	40	.53	.168
Timeliness	.66733	.62693	4.04^{-02}	1	40	4.85	.03
Clinic Hours	.66733	.39710	.2703	1	40	32.49	.000

ANOVA

Having established the significance of the independent variables on the dependent variable, productivity, ANOVA testing was conducted to find out if there were any differences in productivity (RVUs per encounter) between the three quarters and between the two types of clinic settings (primary care versus specialty care). ANOVA testing was also conducted to see whether there were differences in productivity if the coder coaches had prior working experience as coders. The results of ANOVA testing to see the differences in productivity between quarters 1 and 4 FY05 and quarter 1 FY06, between Family Practice Clinic, Obstetrics Clinic, and Orthopedic Clinic, and based on work experience of coder coaches is displayed in Tables 8, 9, and 10 respectively.

The ANOVA results presented in Table 8 show the mean differences of productivity in the three clinics during three quarters (over time). All three clinics, the

Family Practice Clinic ($F^{2,8} = 18.06$, $p<.01$), the Orthopedic Clinic ($F^{2,8} = 17.23$, $p<.01$), and the Obstetrics Clinic ($F^{2,8} = 8.81$, $p<.01$), showed significant differences in productivity during the three quarters. Tukey multiple comparison tests were conducted to determine which specific pairs of quarters were significantly different. The Family Practice Clinic produced .01 higher RVUs per encounter in quarter 4 FY05 compared to quarter 1 FY05, $p<.01$ and .1 higher RVUs per encounter in quarter 1 FY06 compared to quarter 1 FY05, $p<.01$. The Orthopedic Clinic also generated .23 higher RVUs per encounter in quarter 1 FY06 compared to quarter 1 FY05 and .18 higher RVUs per encounter in quarter 4 FY05 compared to quarter 1 FY05. In the Obstetrics Clinic, provider productivity was lower by .19 RVUs per encounter in quarter 1 FY06 when compared to quarter 4 FY05.

Table 8

One-way ANOVA summary results of quarters (time) on productivity (RVUs/encounter)

Clinic	FY05 Qtr1 Mean/(SD)	FY05 Qtr 4 Mean/(SD)	FY06 Qtr1 Mean/(SD)	*F*	*p*	Pair Diff
OB	.79 (.02)	.93 (.07)	.74 (.06)	8.81	.016$	**
Family Practice	.51 (.01)	.61 (.03)	.62 (.02)	18.06	.003&	*
Orthopedic	.76 (.03)	.95 (.07)	.99 (.04)	17.23	.003&	*

Note. Tukey multiple comparisons test:

**FY05 quarter 4 different from FY06 quarter 1, $p < .05$

* FY05 quarter 1 different from FY05 quarter 4 and FY06 quarter 1, $p < .01$

$ $p < .05$ & $p < .01$

The ANOVA results presented in Table 9 show the mean differences in productivity in the two types of clinics settings (primary care and specialty care). Productivity in the Family Practice Clinic (primary care setting) was significantly different ($F^{2,8} = 24.92$, $p < .000$) than both the Obstetrics and the Orthopedic Clinics (specialty care setting). Tukey multiple comparison tests were conducted to determine which clinic setting was significantly different. The Family Practice Clinic showed significant difference in productivity with a mean difference of –.23 RVUs per encounter in the Obstetrics Clinic and with a mean difference of –.32 RVUs per encounter in the Orthopedic Clinic ($p < .001$).

Table 9

One-way ANOVA summary results of clinic setting (service) on productivity (RVUs per encounter)

	Means/(SD)					
Productivity Outcome	OB	FP	ORTHO	*F*	*p*	Pair Diff
Clinic Setting Mean/ (SD)	.82 (.09)	.58 (.05)	.91 (.11)	29.12	.000	*

Note. Tukey multiple comparisons test: * Family Practice clinic had significantly different productivity than both Obstetrics and Orthopedic clinics, $p< .001$

Finally, The ANOVA results presented in Table 10 show the mean differences in provider productivity (RVUs/encounter) based on the work experience of coder-coaches assigned to the three clinics. Work experience was coded as 1= coder-coaches have no experience (no experience), 2 = coder-coach have less than 6 months but greater than 0 months coding experience (partial experience), and 3 = coders have greater than 6 months coding experience (full experience). Provider productivity in clinics with full experience (> 6 months) was found to be higher when compared to clinics with coder-coaches with partial (>0 & < 6 months) experience and no experience ($F^{2, 8} = 49.49$, $p<.000$). Tukey multiple comparison tests were conducted to determine which clinic was significantly different with respect to work experience. The Orthopedic Clinic, where the coder-coach had full coding experience, was higher than the Family Practice Clinic where coder-coaches had partial coding experience and at the Obstetrics Clinic where both coder-coaches had no experience ($p< .01$). Productivity in the Orthopedic Clinic showed a significant difference with a mean difference of .38 RVUs per encounter when compared to the Family Practice Clinic and showed a mean difference of .26 RVUs per encounter compared to the Obstetrics Clinic.

Table 10

One-way ANOVA summary results of coder-coach work experience on productivity (RVUs/encounter)

	Means / (SD)					
Productivity Outcome	No Exp	Partial Exp	Full Exp	*F*	*p*	Pair Diff
Coding Experience	.74 (.06)	.62 (.02)	.99 (.04)	49.49	.000	*

Note. Tukey multiple comparison test: * Clinics assigned coders with full experience different from clinics assigned coders with no experience and partial experience, $p < .01$.

Both the efficiency and the effectiveness of the coder-coach program were also analyzed. Efficiency was analyzed by conducting a simple cost-benefit analysis of the coder-coach initiative. Total costs and potential PPS earnings in the three clinics were compared for quarter 1 FY05 and FY06. Total cost increased by 12%, from $1,877,782 in quarter 1 FY05 to $2,103,130 in quarter 1 FY06 in the Obstetrics Clinic. For the same periods, potential PPS earnings increased by 28.2%, from $842,093 to $1,079,696. For the Family Practice Clinic, costs decreased by 2.7%, from $4,245,643 to $4,127,834 and PPS earnings increased by 24.9%, from $1,145,576 to $1,431,440 during the same periods. In the Orthopedic Clinic, the costs increased by 39.2%, from $1,251,407 to

$1,743,144 and potential PPS earnings increased by 87.7%, from $276,068 to $518,348.

Discussion

The purpose of this study was to investigate the impact of coder-coaches on provider productivity (RVUs), through improved documentation and coding, during the quarter beginning October 01, 2005, and ending December 31, 2005. The study also investigated the effect of other variables, such as STs, data accuracy, data timeliness, and number of hours available on total RVUs, at each of the three clinics. The study primarily looked at three hypotheses (one per clinic) to establish that there were significant differences in provider productivity in each of the three clinics investigated, during quarter 1 FY06, the post implementation phase of coder-coach initiatives.

H_{o1}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Obstetrics Clinic.

H_{a1}: There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Obstetrics Clinic.

The results indicated that in the Obstetrics Clinic, significant differences existed in productivity during the two quarters, quarter 4 FY05 and quarter 1 FY06, indicating that the null hypothesis can be rejected. Although the study was not looking at the direction of the change in productivity, it is appropriate to state here that provider productivity was lower by .19 RVUs per encounter in quarter 1 FY06 when compared to quarter 4 FY05.

H_{o2}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 3 FY05 and quarter 1 FY06 at the Family Practice Clinic.

$H_{a2:}$ There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Family Practice Clinic.

In the Family Practice Clinic, significant differences in productivity existed between the all three quarters, rejecting the null hypothesis. However, unlike the Obstetrics Clinic, providers in Family Practice Clinic were more productive in both quarter 4 FY05 (.01 RVUs per encounter) and quarter 1 FY06 (.1 RVUs per encounter) when compared to quarter 1 FY05.

H_{o3}: There is no difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 3 FY05 and quarter 1 FY06 at the Orthopedic Clinic.

$H_{a3:}$ There is a difference in productivity between quarter 1 FY05 and quarter 1 FY06 and/or quarter 4 FY05 and quarter 1 FY06 at the Orthopedic Clinic.

In the Orthopedic clinic, the null hypothesis was again rejected as significant differences existed between quarter 1 FY05 and quarter 4 FY05 and quarter 1 FY06. Compared to quarter 1 FY05, providers in the Orthopedic Clinic generated .18 higher RVUs per encounter in quarter 4 FY05 and .23 higher RVUs per encounter in quarter 1 FY06.

The most likely reason for the increase in provider productivity is the contribution of coder-coaches in assisting the providers with better coding and improved documentation through the use of the CHCSII. The fact that the coder-coaches are making a difference in the provider productivity is confirmed by coding audits conducted by the 3M HIM consultancy team during the week of 17 February 2006. The 3M audit results showed that services coded by the Family Practice providers yielded 1.15 RVUs per encounter. When the same services were coded by the coder-coaches, their yield was 1.36 RVUs per encounter and when coded by the 3M audit team, yielded 1.38 RVUs per encounter. This audit showed that the coder-coaches helped increase the provider productivity by over 18%. Similar coding audit by 3M in the Orthopedic Clinic yielded an additional 45.95 RVUs per encounter (S. Moore, 3M HIM consultant, personal communication, 10 February 2006). These results support the need for specially educated and trained coder-coaches who can assist and provide guidance to the providers on how to code and document accurately and completely, resulting in higher RVUs per encounter and maximizing the provider and organizational productivity. The command at TAMC must continue to support the coder-coach initiatives until a majority of providers are adequately trained in coding their encounters.

ANOVA testing to measure the mean difference in productivity of coder-coaches in the two clinic settings (primary vs. specialty) also support the fact that specialty care clinics generate more RVUs per encounter than primary care settings because of the more complex case mix of diseases, procedures, and diagnoses in the specialty care. In a previous study (King, Sharpe, & Lipsky, 2001), no statistically significant relation were found between physician accuracy in coding and type of practice (primary vs. specialty care). ANOVA test results also showed that the Obstetrics Clinic had higher productivity by .23 RVUs per encounter and the Orthopedic Clinic had higher productivity by .32 RVUs per encounter compared to the Family Practice Clinic ($p < .001$). As can be seen in Appendix B, for quarter 1 FY06, total simple RVUs (total encounter) in the Family Practice Clinic were 8095.39 (13,002) to yield .62 RVUs per encounter, in the Obstetrics Clinic 6032.97 (8162) to yield .74 RVUs per encounter, and in the Orthopedic Clinic 4289.01 (4310) to yield 1.0 RVUs per encounter. In quarter 1 FY06, the two specialty clinics, Orthopedic and Obstetrics, generated higher RVUs per encounter than the Family Practice Clinic. The Orthopedic Clinic generated over 61% higher RVUs per encounter and the Obstetrics Clinic generated over 19% RVUs per encounter. Higher productivity in specialty clinics is also supported when looking at simple RVUs per encounter data retrieved from M2. As shown in Appendix B, the average RVUs per encounter for the 12 months in FY05 were .56 for the Family Practice, .85 for the Obstetrics, and .94 for the Orthopedic Clinics. The command must therefore focus its resources (coder-coaches) on specialty care areas to generate higher reimbursements for the organization.

When addressing the issue of the quality of coder-coaches as factors affecting the productivity, the study looked at the education/certification and prior coding experience of the coder-coaches. Certification of coder-coaches, as a variable was not tested as all coder-coaches were equally qualified as CPCs. The Orthopedic Clinic, where the coder-coaches had full experience (greater than 6 months), had a higher productivity (mean difference) of .26 RVUs per encounter compared to the Family Practice Clinic where only one of the two coder-coaches had prior work experience (partial experience). The Orthopedic Clinic had higher productivity (mean difference) by .38 RVUs per encounter when compared to the Obstetrics Clinic where neither of the two coder-coaches had any prior coding experience. Further investigation as to why productivity was so low in the Obstetrics Clinic revealed that, (1) the coder-coaches did not begin in the clinic until 27 November 2006, unlike the Family Practice and the Orthopedic Clinics where the coder-coaches began coaching providers almost a month before on 24 October 2006. The data only looked at one month (27 November to 31

December) where the coder-coaches were actively involved in coaching the providers (2) The coder-coaches did not start providing feedback to providers until two weeks into their coaching. This further impeded the provider's ability to improve coding and documentation during the month (3) The Obstetrics Clinic lost one coder-coach the first week of December and a new coder-coach was hired immediately. Accordingly, the author believes that practical and useful results for the Obstetrics Clinic can be investigated again after the clinic has taken advantage of the coder-coaches during the second quarter of FY06. These results provide further guidance for minimum qualifications of coder-coaches that TAMC should include in their contracts with vendors, if the Jumpstart initiatives are to continue in FY07.

In order to conduct a conceptual framework analysis, the study used cost, access, and quality (triad) as the framework (see Figure 3). The cost of purchasing services of 12 coder-coaches and a three-member team of audit consultants from 3M HIMC is estimated at $924,000 ($624,000 and $300,000 respectively). For an analysis of the affect of the coder-coaches on access, this study used the ability of patients to schedule appointments as a measure. According to the AMEDD PLPSS, 43608 responses (32.1% response rate) were received from the sampled visits in quarter 1 FY05 and 58582 (36.6% response rate) responses were received in quarter 1 FY06. Patient access essentially remained the same during quarter 1 FY06 (76.13%) and quarter 1 FY05 (75.66%). Similar trends were noticed at the clinic level. The Family Practice Clinic showed a very small change in patient access from 74.74% to 74.97% and the Obstetrics Clinic recorded 73.41% compared to 73.46% in quarter 1 FY05. The Orthopedic Clinic showed a decline in patient access from 75.54% in quarter 1 FY05 to

63.76% in quarter 1 FY06. This study looked at the microview dimension of healthcare quality, particularly the clinical aspects of delivery, which was measured by the overall patient satisfaction due to increased access. Overall patient satisfaction results for the two quarters, quarter 1 FY05 and quarter 1 FY06, showed a minor improvement from 91.59% to 92.33%. Overall patient satisfaction in the Family Practice Clinic improved insignificantly from 93.34% to 93.71%, however, the Orthopedic Clinic improved from 87.53% to 91.73%. The Obstetrics Clinic showed a small decline in overall satisfaction from 91.34% to 89.40%.

Considering that there has been almost no major shift in the total beneficiary population, it would be safe to assume that the providers are succeeding in capturing lost workload through better documentation and coding. The author believes that the coder-coach initiative is a major contributing factor along with the use of more efficient CHCSII. In order to study the effectiveness of the coder-coach initiatives, the outcomes of the study were evaluated. Effectiveness was measured by analyzing whether the three clinics achieved the required 3.5% increase in their productivity. Based on the total simple RVU data in Appendix A, the increase in productivity goals for the three clinics in quarter 1 FY06, compared to quarter 1 FY05, were 224 additional RVUs for the Obstetrics Clinic, 242.34 for the Family Practice Clinic, and 99.81 additional RVUs in the Orthopedic Clinic. Both the Family Practice and the Orthopedic Clinics exceeded their quarter 1FY06 goals with the highest increase in the Orthopedic Clinic by 1437.32 RVUs (50.4%) and by 1171.38 RVUs (16.91%) in the Family Practice Clinic. The Obstetrics Clinic had a decline of 938.47 RVUs during the same quarter. Possible reasons for the decline in productivity in the Obstetrics Clinic were discussed earlier.

These results further support the use of coder-coaches in the specialty clinics, where the returns seem to be higher than in the primary care setting.

In order to meet one of the key strategic goals of efficiency, MHS measures productivity by looking at the RVUs per full time equivalent (FTE) and cost per RVU (Baird & Priest, 2004). This study also measured the productive efficiency of the program by measuring RVU per FTE. RVUs per FTE were the highest in the Orthopedic Clinic (24.18%) (197.83 compared to 159.31 RVUs per FTE) in quarter 1 FY06 compared to quarter 1 FY05. During the same period, the Family Practice Clinic had a negligible gain (.97%) in RVUs per FTE and the Obstetrics Clinic actually showed a decline of 2.38% in RVUs per FTE (230.53 during quarter 1 FY06 compared to 236.16 in quarter 1 FY05). Further investigation led the author to find that up to three providers were deployed from the Family Practice Clinic during the duration of this study and none were deployed from both the Obstetrics and the Orthopedic Clinics. According to TAMC's operational metrics data, provider time distribution in the Family Practice Clinic showed that providers spent 5.6% less time in outpatient care (fewer encounters) in quarter 1 FY06 compared to quarter 1 FY05. This has also impacted the productivity in the Family Practice Clinic. RVUs per FTE data is displayed in Appendix B. When analyzing the cost per RVU, the author found that two of the three clinics were conducting business more efficiently in quarter 1 FY06 when compared to quarter 1 FY05. The Family Practice Clinic's cost per RVU declined from $613.18 to $509.90 (16.84% decline) and the Orthopedic Clinic's cost per RVU declined from $438.83 in quarter 1 FY05 compared to $406.42 (7.39% decline) in quarter 1 FY06. On the other hand, the Obstetrics Clinic's cost per RVU increased by as much as 29.42% from

$269.35 to $348.61 in quarter 1 FY06. This was primarily due to a decrease in RVUs from 6971.44 in quarter 1 FY05 to 6,032.97 in quarter 1 FY06 and an increase in the variable costs by almost 9% (from $164,265 in quarter 1 FY05 to $178,645 in quarter 1 FY06). Cost center expenses (i.e., total expenses for a work center for each month) also increased for the Obstetrics Clinic from $1,254,669 to $1,341,983 during the same periods.

Conclusions and Recommendations

The coder-coach program, in combination with the implementation of CHCSII, improved provider documentation, even though there are systemic problems with data capture in CHCSII. These findings are clear evidence that the coder-coach program should be strongly supported by the command at TAMC. The results of this study provide the commander and her executives readily interpretable information that can be used to focus their efforts in improving documentation and coding. Awareness that accurate documentation will lead to better and adequate staffing in the clinics, uniform coding, likely reduction in administrative costs, enhanced data quality and integrity, and improved decision-making will also help in delivering quality healthcare to our beneficiaries. Considering the short period of the study (one quarter), the author believes that this study should be continued until the end of the fiscal year to better gauge the results of the coder-coach program over a longer period. Future studies can also include a cost comparison between using coder-coaches to support provider documentation and remote coding. Additional studies must also be conducted to replicate this study and to assess if other variables such as, administrative and ancillary support, clinic size, and deployments make a major impact on productivity. Although this study only looked at the affects of the coder-coach initiatives using sample data specific to TAMC, the techniques employed could be adapted readily to other MTFs with in DoD and even in the civilian healthcare organizations.

Ethical Considerations

No federal funding was requested or authorized to conduct the study. Health Insurance Portability and Accountability Act regulations as well as other federal legislations that dictate right to privacy law (Public Law 95-38) for protection of beneficiaries' personal information were thoroughly followed. No personal data that could identify individual patients by names, Social Security number, or any other means were used; therefore no permission from TAMC's Institutional Review Board was required to conduct the study. Approval was sought from each department chief to allow the data collection and analysis as well as audit results used in the study.

Limitation of the Study

On a macro level, the Jumpstart initiatives were developed by each of the MTF without any formal planning (Sloan, 2005). The RMD and PAD developed the goal of 69,900 RVUs using previous year's numbers and without a business case analysis, primarily due to the short suspense set by the Army's TSG. Another limitation of the study was the quality of coder-coaches (experience with coding and MHS) that were available on the island of Oahu, Hawaii. Because of the geographic isolation, TAMC relied on the availability of limited number of qualified applicants. The coder-coach program did not start in time because qualified coders were difficult to find on the island. In most clinics the coder-coaches started almost one month late and in some cases (as in case of the Obstetrics Clinic) coder-coaches did not come on board until two months late. The Obstetrics Clinic also had to replace one of their coder-coaches within a week of starting the program. This severely affected the ability of clinics to achieve even higher productivity during the first quarter. CHCSII has negatively impacted productivity at TAMC where CHCSII is being used for documentation and as an electronic health record (EHR). According to CHCSII system analysts and engineers, it is estimated that CHCSII is currently not capturing and recording anywhere from 10% to 15% of the encounters. This trend exists throughout the facilities utilizing CHCSII (C.E. Lasome, personal communication, December 28, 2006). Other CHCSII issues being worked on involve how the data is captured to generate RVUs. For example, CHCSII does not allow inclusion of more than one evaluation and management (E&M) code per encounter even though multiple E&M services may be provided during the same encounter. Similarly, CHCS only allows for four CPTs to be included per encounter. Any additional E&M services and CPTs are automatically excluded from generating RVUs resulting in lower RVUs for the encounter.

On a micro-level, because the study lacks randomization in selection of samples, the results could have been achieved due to other confounding factors not considered in the study. The results lack the clear evidence of true effect which is possible with randomized controlled trials, the gold standards in research. Lack of randomization is also a threat to internal validity of the study design (Cooper & Schindler, 2003). Another limitation of the study is that of maturation which also affect the internal validity. Changes in the provider's ability and skill to code more accurately, without the coaching by coders, could be due to passage of time or maturation. This condition could have influence the accuracy of coding during the three-month period. Other limitations that can affect external validity and the outcome of the study include sample selection (as discussed above can also affect internal validity), lack of understanding of the MHS and provider incentives to provide care in the MHS, and the initial period of orientation to the CHCSII system, for both the providers and the coder-coaches.

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Appendices

Appendix A

MONTH	MEPRS	RVU
OCT	BCCA	2169.54
NOV	BCCA	2424.33
DEC	BCCA	2377.57
JAN	BCCA	2448.07
FEB	BCCA	2092.48
MAR	BCCA	2604.70
APR	BCCA	2563.51
MAY	BCCA	2703.74
JUN	BCCA	2850.02
JUL	BCCA	2657.93
AUG	BCCA	2883.56
SEP	BCCA	2338.15
OCT	BCCA	1951.56
NOV	BCCA	2040.27
DEC	BCCA	2041.14
OCT	BGAA	2310.73
NOV	BGAA	2351.45
DEC	BGAA	2261.83
JAN	BGAA	2559.73
FEB	BGAA	2216.97
MAR	BGAA	2879.81
APR	BGAA	2813.76
MAY	BGAA	2617.93
JUN	BGAA	2868.93
JUL	BGAA	2452.27
AUG	BGAA	3100.82
SEP	BGAA	2887.87
OCT	BGAA	2815.36
NOV	BGAA	2894.15
DEC	BGAA	2385.88
OCT	BEAA	929.44
NOV	BEAA	1045.66
DEC	BEAA	876.59
JAN	BEAA	1236.06
FEB	BEAA	1443.31
MAR	BEAA	1688.68
APR	BEAA	1835.90
MAY	BEAA	2008.25
JUN	BEAA	2220.36
JUL	BEAA	1696.85
AUG	BEAA	1881.37
SEP	BEAA	1749.05
OCT	BEAA	1486.46
NOV	BEAA	1384.87
DEC	BEAA	1417.68

Appendix B

Total simple RVUs, total encounters, total PPS earnings, total cost, RVUs per full time equivalent and per encounter for FY05 quarter 1 and FY06 quarter 1

Clinic/Time Period	Obstetrics Clinic	Family Practice	Orthopedic Clinic
Total simple RVUs			
FY05 Qtr 1	6,971.44	6,924.01	2,851.69
FY06 Qtr 1	6,032.97	8,095.39	4,289.01
Total encounters			
FY05 Qtr 1	8,820	13,401	3,723
FY06 Qtr 1	8,162	13,002	4,310
Total potential PPS earnings			
FY05 Qtr 1	$842,093	$1,145,576	$276,068
FY06 Qtr 1	$1,079,696	$1,431,440	$518,348
Total cost			
FY05 Qtr 1	$1,877,782	$4,245,643	$1,251,407
FY06 Qtr 1	$2,103,130	$4,127,834	$1,743,144
Average RVUs/FTE			
FY05 Qtr 1	236.16	220.86	159.31
FY06 Qtr 1	230.53	223.01	197.83
Average RVUs/Enc	.84	.58	.95
FY05 Qtr 1	.79	.52	.77
FY06 Qtr 1	.74	.62	1.00

Source: M2 Data Mart as of 15 Feb 2006.

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14. ABSTRACT

The MHS is beginning a dramatic shift towards controlling costs and increasing productivity. To achieve these goals, the MHS initiated the Jumpstart Program, which provided Tripler Army Medical Center $924,000 to hire 12 coder-coaches to increase provider workload by 69,900 RVUs. The coder-coaches directly assist and coach providers in improving documentation and coding of encounters. The purpose of this study is to investigate the impact of coder-coaches on provider productivity, measured in RVUs, through improved documentation and coding at three clinics at TAMC during the first quarter (Q1) FY06. The full-model regression equation accounted for 66.73% of the variance in productivity ($F_{4, 40} = 20.06$, $p<.000$). ANOVA showed that the family practice ($F_{2, 8} = 18.06$, $p<.01$), orthopedic ($F_{2, 8} = 17.23$, $p<.01$), and obstetric clinics ($F_{2, 8} = 8.81$, $p<.01$) had higher productivity during Q1 FY06 compared to the same quarter in FY05. Specialty care setting had higher productivity than the primary care (family practice) setting ($F_{2, 8} = 24.92$, $p<.000$). The study supported having experienced coder-coaches who generated higher RVUs (.38 RVUs per encounter in orthopedic clinic, $p<.01$).

15. SUBJECT TERMS

Relative value units, provider productivity, coder coaches, coding, provider documentation

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